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### THE LOSS OF H. M. S. VICTORIA.

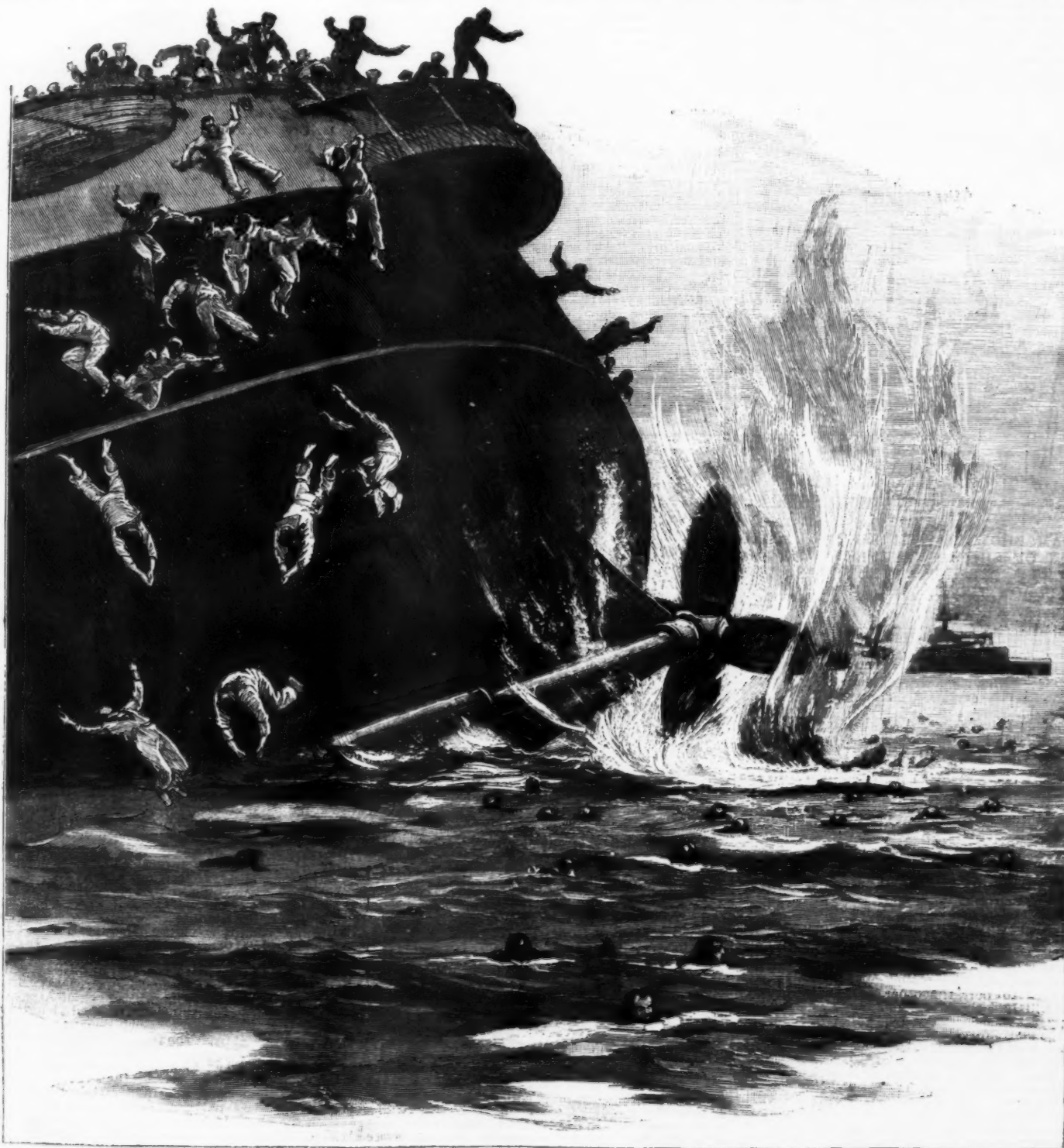
THE terrible story of the collision between the Victoria and the Camperdown is clearly and lucidly told in the dispatches which Rear-Admiral Markham has sent home from the Mediterranean. Surely news more inexpressibly sad has never before been set forth in an official document. The great loss of life and property, which we all deplore, was not caused by any breakdown or defect of machinery, not even by the carelessness or negligence of man, but was the direct and foreseen result of instructions, the execution of which appears to have been plainly incompatible with the safety of those who obeyed them. Why these instructions were given, the reason for them we shall never learn, for they were the twice repeated orders of the lamented commander-in-chief, the experienced and capable seaman whose heroic death is the admiration and regret of the civilized world.

On Thursday, June 22, 1893, at ten o'clock in the forenoon, a British squadron weighed anchor in the harbor of Beyrout, and proceeded north along the Syrian coast, steering for the port of Tripoli. There were thirteen ships—eight battle-ships, the Victoria, Camperdown, Nile, Dreadnought, Inflexible, Collingwood, Edinburgh and Sans Pareil, and five cruisers, the Edgar, Phaeton, Amphion, Fearless and Barham. Very shortly after leaving the anchorage the squadron was formed in line abreast, and the rate of progress was fixed at eight knots an hour.

Noon passed, the men went to dinner, and then to their various avocations. The course, which had been N. by E., was changed at 1:30 to N. E. by N., or more to the right, probably in order that the track of the squadron might follow the trend of the coast. Shortly afterward Sir George Tryon sent for the flag-captain and the staff commander (an officer who occupies approximately the responsible position which, in the old

days, was known as the master of the fleet), to arrange with them about bringing the squadron to anchor at Tripoli.

Sir George informed his subordinates that he intended to form the fleet in two columns "disposed at port"—that is to say, with the second column on the port side of that one led by himself as the guide of the squadron. He also settled that the distance between the two columns should be six cables or 1,200 yards. In this formation he proposed to steam on until the Victoria should be sufficiently past a certain spot of the coast known as the Tower of the Lions, by a compass bearing, on which it was intended to anchor. Then he would, by signal, invert the lines by turning the columns inward sixteen points, or to the faceabout, so that on reaching the line of bearing for turning up to the anchorage the fleet should alter course together eight points to port, which would bring the squadron into columns of divisions line abreast to port, columns



THE LOSS OF H. M. S. VICTORIA—THE MEN JUMPING FROM THE SHIP AS SHE TURNED BOTTOM UPWARD BEFORE GOING DOWN.  
DRAWN BY J. NASH, R.I., FOR "THE GRAPHIC," LONDON. FROM SKETCHES BY AN OFFICER WHO WITNESSED THE SCENE.

disposed astern, and in this formation he intended anchoring.

When the admiral had explained his intention Staff Commander Hawkins-Smith suggested that eight cables would be a better distance to form up into two divisions than six cables; to which the admiral replied, "Yes; it should be eight cables." As a matter of fact, even eight cables, or 1,600 yards, was no great space in which to turn two or more vessels in toward one another, when it is taken into consideration that a battle ship's tactical diameter is usually assumed to be 800 yards. A safer margin would have been nine cables, and ten cables would have allowed the evolution to be carried out comfortably, and given the two cables distance between the lines which Sir George Tryon, by a second and following order, intended them to preserve. However, eight cables was mentioned, and the staff commander left the cabin and went up on deck.

At twenty minutes past two, by the Camperdown's signal log, the following signal was hoisted in the Victoria: At the masthead two flag, two pendant, the compass pendant, one flag, and six flag, signifying that the second division were to alter course in succession sixteen points, turning to starboard, and preserving the order of the fleet. At the yardarm was shown two flag, one pendant, one flag, six flag, and the compass pendant, signifying that the first division were to alter course in succession sixteen points, turning to port, and preserving the order of the fleet. Now the practice of the navy is for leaders of columns to repeat all signals the nature of these, while the other vessels hoist an answering pennant. But the repeating ships only hoist the signal at the dip, or partially, until they see that all the other vessels have understood and answered. If any ship is unable to make out the signal or its purport, she keeps her pendant at the dip until she makes it out.

Now, when this signal was made, Rear Admiral Markham was himself was on the bridge of the Camperdown, and when it was repeated to him, he thought that the columns were too close to execute such an evolution, so he told his flag lieutenant to keep the signal at the dip. He also ordered him to make a signal by semaphore to Sir George: "Am I to understand that it is your wish for the columns to turn as indicated by the signal now flying?" If this signal

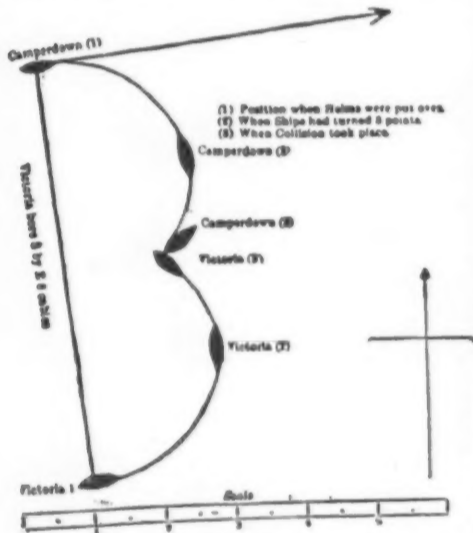


DIAGRAM SHOWING THE ASSUMED POSITION OF SHIPS FROM THE TIME THE HELMS WERE PUT OVER UNTIL THE COLLISION TOOK PLACE.

had been made, it is possible that the terrible blow might never have fallen; but before it could be made, the commander-in-chief made by semaphore, which is a very quick way of signaling, "What are you waiting for?" Now some writers have jumped to the conclusion that the evolution had already begun, and that this delay on the part of the Camperdown might have had something to do with the subsequent mishap. But these persons do not understand the navy method. It is not the hoisting of a signal that is executive, but its being hauled down; and, therefore, as the Victoria could not haul down until all the ships had answered, and the Camperdown by keeping her flags at the dip had not signified that she understood what was wanted, the evolution could not commence.

It now occurred to Admiral Markham that Sir George wished him to turn sixteen points in the Camperdown, but that with the Victoria he intended to take a wide sweep, leaving the second division on the port side. Then says Admiral Markham: "Having the fullest confidence in the great ability of the admiral to maneuver the squadron without even the risk of a collision, I ordered the signal to be hoisted right up as an indication that it was understood."

Then the signals were hauled down and the two leaders at once put their helms over, hard over, the one to turn to port, the other to starboard. Our diagram will best show what took place then. There was only a distance of twelve hundred yards between the two ships, and they were steaming eight knots an hour; it would, therefore, take no longer than two minutes, scarcely that, to cross the intervening space. That a collision was inevitable seems to have been obvious in an instant to every one who was within sight. The danger was promptly realized on board the two ships. On board the Camperdown the starboard screw was set going astern, and in the Victoria the port one, the purpose being to lessen the turning circles of the respective ships, and get them round quicker. Before the collision, also, both ships were going full speed astern, but it was now too late, and they crashed into one another with tremendous

force, the Camperdown's ram and her bow crushing into the Victoria nearly half way across the ship.

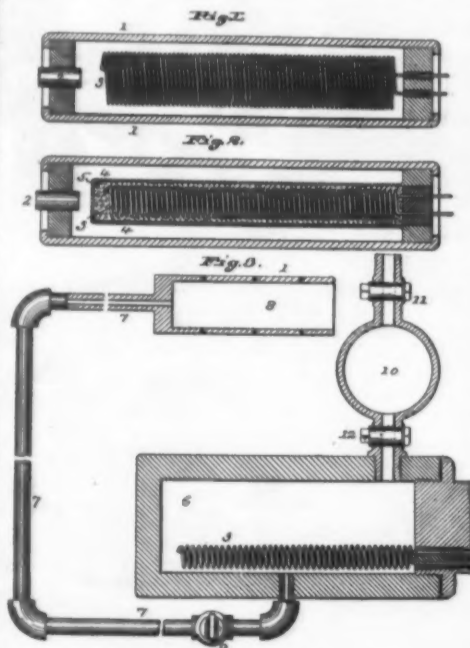
And now we get a graphic picture of the occurrences on board the ill-fated vessel from the report of Captain the Hon. Maurice Bourke, supplemented by stories from others who were saved. The order had been given before the collision occurred to close watertight doors and get the collision-mat ready, but the latter was found to be useless, as the bows went under water too quickly. To see that the former had been done Captain Bourke went below, where he spoke to the fleet engineer, who told him that all was right abaft the foremost boiler-room, and he was returning to report this to the admiral when the ship went down. Meanwhile the men had fallen in under their officers on the port side of the upper deck, and there, calmly and without panic, awaited further orders. These were not long in coming. As soon as the Camperdown backed out of the hole she had made, the rammed battleship heeled over to starboard and began to settle down. But few, if any, of those on board realized what was about to happen. The commander-in-chief, who, with Captain Hawkins-Smith, was on the top of the chart-house, so little anticipated the suddenness of the end that when it was reported to him that the Dreadnought was lowering her boats, he made the signal, "Annul or negative sending boats." He wished to push into the harbor and put the vessel in shoal water, and orders were given to go half-speed ahead with this intention. But the steering-gear had now broken down, and although the engineers and stokers stuck gallantly to their posts, and died there, their efforts were unavailing. The ship was gradually canting over further and further to starboard, the water came up so fast that the flag-lieutenant was washed off the upper deck, the captain off the bridge, and then, as the admiral tells everybody to save themselves, she goes over with a sudden awfulness, and, turning bottom up, engulfs every one near her.

"I found myself," writes the captain, "sucked down, but came up to the surface again, among the wreckage." His experience was, doubtless, that of scores; while many more who were sucked down got entangled in the rigging, or were struck by the wreckage and drowned. "I was taken down by, I think, the small mast," says Commander Hawkins-Smith; "when I came up I found some loose oars close by, with which I supported myself until picked up by the Dreadnought's whaler. After finding myself in the water I never saw the admiral again."

There is little more to tell except a tale of splendid heroism on the part of every one concerned. The behavior of the men was magnificent; not one attempted to leave the place to which he was ordered, much less to jump overboard until leave was given. Then, unfortunately, there is too much reason to fear that there were many who could not swim, and that these prevented those who could by clutching them, as drowning men will. "At the moment the admiral gave his final order to the men to save themselves," says one who was present, "the blue jackets with their petty officers were drawn up in regular ranks on the upper deck. When they broke rank at the order there was much crowding, but that was in consequence of the cramped position and because the ship was then heeling over nearly twenty-four degrees. Probably few had much hope of saving themselves, but they met their fate bravely and calmly, and their discipline and obedience, in the minds of those who witnessed it, furnishes the most pathetic recollection of the whole sad scene. Waiting on the quarter deck their behavior was heroic, and in the water it was generous beyond all praise. The stronger men and better swimmers swam around, helping their weaker comrades, and calling out encouragement."

#### HYDROTHERMAL MINING PROCESS.

CHARLES W. BREHLER, of St. Louis, Mo., is the author of the following novel process: A thermal or resistance coil 3, of German silver, platinum, or other



suitable metal, is arranged within the cartridge, and affords the means of communicating a sudden and high temperature to the confined liquid by the passage of a suitable current of electricity through the coil in the usual well-known manner; the terminals of such coil being properly insulated where they pass out through the wall of the cartridge casing, as clearly illustrated in the drawings.

In order to avoid a disruption of the coil by the rapid discharge of the cartridge, I inclose it within a suitable interior casing 4, filled with a body or mass 5 of any suitable material that possesses the dual properties of a conductor of heat and a non-conductor of electricity.

The second or continuous method, above referred to, is best effected by an apparatus substantially of the construction illustrated in Fig. 3. In this the thermal or resistance coil 3, is arranged within an auxiliary chamber or generator 6, of the required size and strength, and which, in the present construction, is adapted to contain the water or other liquid used, and has suitable pipe connections 7, flexible or otherwise, with the hydrothermal cartridge, which in this special form of the apparatus is in the form of an open-ended shell 8, the sides of which may be perforated or not, as desired.

9 is a valve in the connecting pipe 7, for controlling communication between the auxiliary chamber or generator 6, and the hydrothermal cartridge.

10 is a superimposed auxiliary feeding tank connected to the generator 6, and provided with valves 11 and 12, by the manipulation of which a supply of the water or other liquid used can be introduced into the interior of the generator in the following manner: By closing the valve 12, and opening the valve 11, the auxiliary chamber can be filled by hand, and by closing the valve 11 and opening the valve 12, the contents of the auxiliary chamber will flow by gravity down into the generator. The expansive force of the suddenly heated liquid is such as to render it a substitute for explosives in blasting.

#### THE MINE AND TUNNEL VELOCIPEDE.

The machine shown in the accompanying illustration is designed for use in extensive mines and long tunnels, and every detail of its construction has been



most carefully planned and thoroughly tested by two years of continuous work under the most trying conditions. The best material is used in its construction, the frame being of the toughest iron and steel, while the wheels have steel hubs, rolled steel flanges and wooden spokes; the driving gear is machine cut, the crank shaft is hand forged, carefully turned, and carried in brass journal boxes. The seat is of the well-known Garford pattern, specially made of extra strength, and adjustable to any height of rider. This velocipede is so small and light that it can be lifted from the track with one hand, leaving the other free to carry a light or tools. When seated on the machine there is absolutely nothing in front of the rider, and if the wheels run into a fall of rock or earth upon the track when going at high speed the rider is simply shot forward from his seat, and easily maintains his equilibrium by running a few steps.

On an ordinary track the machines can be comfortably operated at the rate of from 10 to 12 miles an hour, and on first class track experienced riders can make from 15 to 20 miles per hour with but little exertion.

This machine was designed by Mr. D. W. Brunton, manager of the Cowenhoven tunnel, of Aspen, Colo., who found after the tunnel had reached a length of over a mile that altogether too much time was consumed in walking to and from the face. The first machine was built in that company's shops, and as soon as it was put upon the track its utility as a time and labor saving device became so evident that the foreman, shift boss and timberman were immediately supplied. The invention was patented, and arrangements made with the Sheffield Velocipede Car Company, of Three Rivers, Mich., for its manufacture. The mine owners and managers in the vicinity of the mine where it was first used were quick to see its advantages, and the car is already in use at no less than ten of the mines about Aspen, including the Cowenhoven, the Bush-

whacker, the Park-Regent and others, and also the Virginus mine and the Revenue tunnel at Ouray, Colo. Its use will certainly extend as it becomes known.—*Eng. and Min. Jour.*

### THE FIFTY TON CRANE OF THE LEROUVILLE QUARRIES.

We live no longer in the time in which King Cheops was obliged to employ 30,000 men for 30 years to erect the great pyramids of Egypt. The progress of mechanics, more and more improved, puts into the hands of man powerful machines that centuple his forces and permit him to play, more and more, the elevated role to which he is logically called, that is to say, to regulate these forces and direct them by his intelligence, instead of exhausting himself in muscular efforts that lead to the desired result only with extreme slowness.

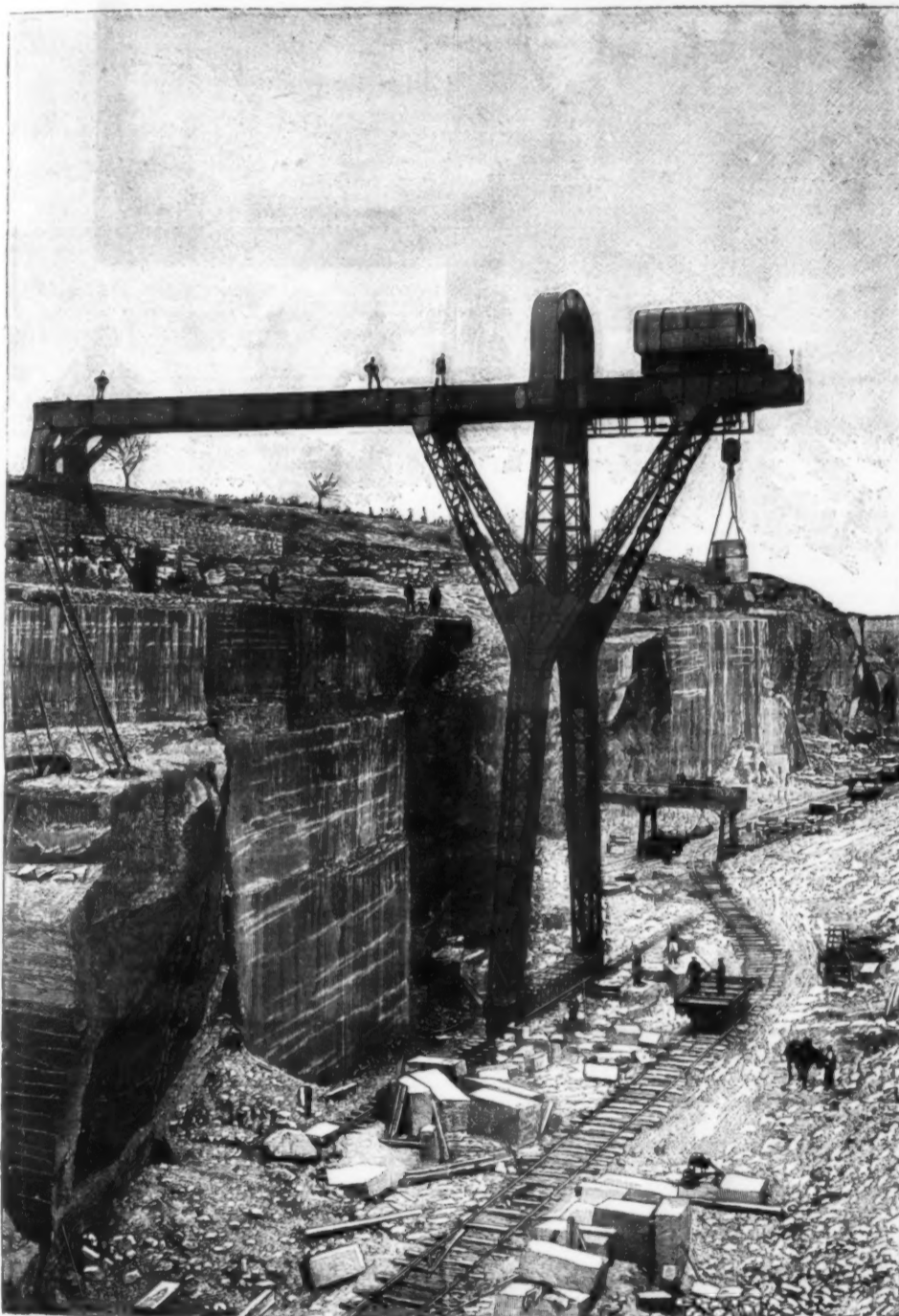
In current work, one horse steam power easily accomplishes in the engine in which it is developed the

placed upon cars and carried away. The idea of throwing them down or sliding them down interminable inclined planes could not be thought of. So it was decided to employ the gigantic metallic crane of 50 tons power, and weighing 120,000 kilogrammes, that we illustrate herewith. It is a play for this apparatus, truly imposing by its power and boldness, to delicately take blocks of the largest size and deposit them upon the cars. The huge crane shifts itself in measure as the work advances. A movable steam engine, mounted upon its platform, communicates motion to it and at the same time serves for maneuvering the blocks.—*L'Illustration.*

### FASTENING OF SPECULUM OR TOOL TO POST.

The following hint, which may be applied to any ordinary grinding or finishing of glass specula, may be used to advantage by amateurs, if not already commonly known:

Fasten a smooth, plain piece of oil cloth upon the per-



A FIFTY TON CRANE OPERATING IN THE LEROUVILLE QUARRIES.

work of ten men. That is a fine enough result; but here comes electricity to permit of transporting the power produced to great distances, by means of a simple wire conductor. This new agent permits of executing work before which human forces formerly remained powerless.

The role of machines is particularly remarkable in the new processes of extraction of the products of the soil—stones, coal, and ores. In mines, they are the powerful rock drills that excavate the galleries and win coal, the great blowers that aerate the works, and huge extraction machines that lift the products or the subterranean water.

In quarries, which are the object of a more and more active exploitation, the primitive processes of extraction have given way to mechanical processes more thoroughly efficacious and more economical. Thus, in the splendid quarries of Lerouville, which furnish our architects with renowned materials, it has been possible to reach a depth of from 35 to 40 meters. Blocks of stone weighing from 5,000 to 8,000 kilogrammes have to be let down from such a height in order to be

perfectly level surface of the grinding post. Lay upon this oil cloth a loose wet sheet of thin cotton cloth, somewhat larger than disk. Lay upon this cloth the disk or the smooth back of the grinding tool, as the case may be. Slide the disk or tool back and forth a little, so as to exclude the air from underneath. The pressure of the atmosphere will now hold tool or disk so firmly that it cannot be moved by any necessary strain used in working, while it can be easily loosened by lifting one edge of the cloth. All cleats are thus rendered unnecessary, and the unequal strain at certain points caused by cleats and consequent danger of irregular figuring of disk are done away with, while at the same time the fastening and unfastening of disk or tool is much more easily and quickly done than in case of cleats. The water used in working with the emery or rouge will, with ordinary attention, keep the cloth properly dampened as well as distribute nearly equal temperature to both sides of disk or tool.

I am satisfied that this method can be used in connection with speculum working machines.

Monroe, Mich., July 12, 1893. J. C. CRITCHETT.

### SOME OF THE ABUSES OF BRUSHES, AND THEIR REMEDIES.\*

By JOHN J. WIKLEN.

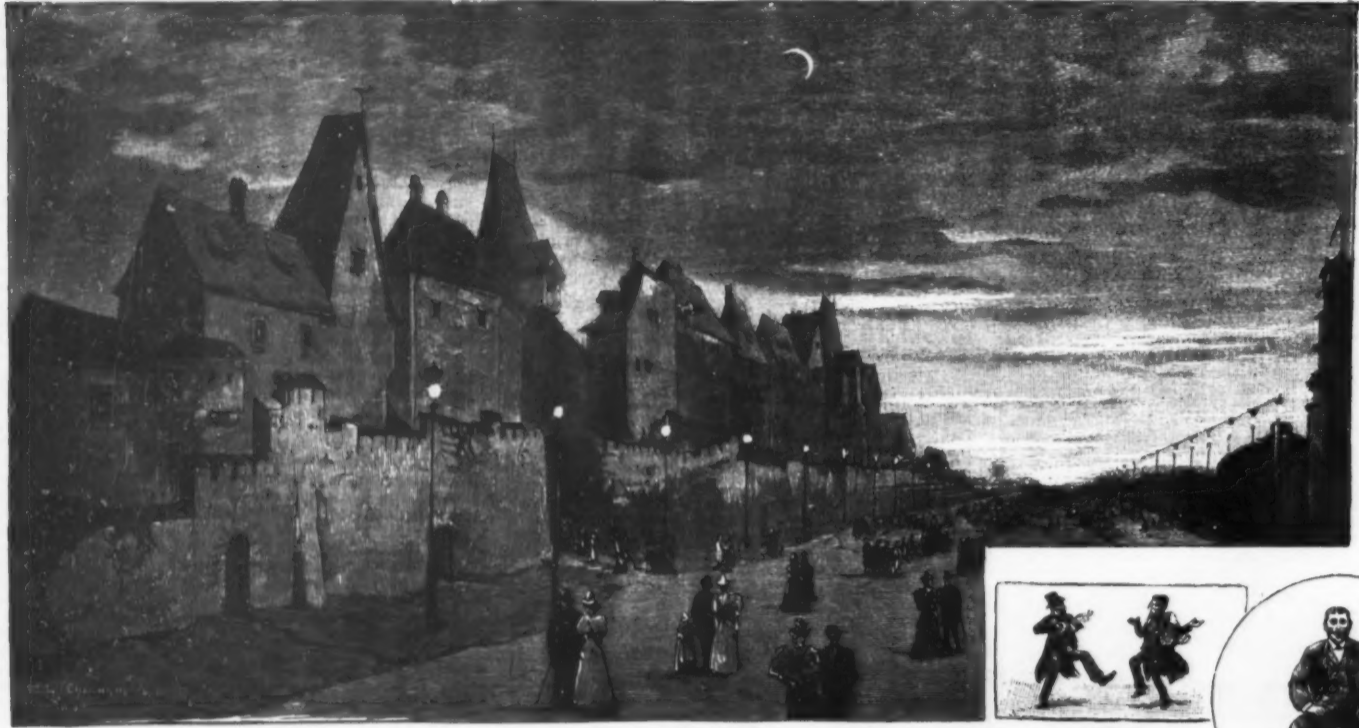
ON a recent trip to Boston, while walking through one of its very crooked streets, my attention was attracted to the display of painters' brushes in the windows of one of the old brush makers of that city. Being interested in brushes, I stopped to examine the display. My hair almost stood on end, for plainly stamped on every brush was this sentence: "Soak well before using." Being a prohibition town or nearly so, I came to the conclusion that water was what the brushes were to be well soaked with. One of the cardinal principles I learned as a brush salesman was to try and help educate users of brushes that water in a new brush was fatal to its good working qualities. That explains the reason for the hair raising. After giving the brush makers ideas for making such a broad assertion, I think you will agree with me that the maxim, "Do not put a brush in water to soak," is the better one of the two. If you will take a hog bristle and cut it across with a penknife, and look at it through a microscope you will find it a hollow tube, and in the soft or flag end it will branch off into a number of small tubes. Just as soon as you put your brush into water to soak, the little tubes all open and the water will rise in the center of your bristles just as far as your brush is dipped. The brush is then laid aside, and after a little time has elapsed is then put into the paint ready to be broken in. The larger proportion of water still remains in the tubes, and just as soon as you put the brush into color, just so soon have you sealed up all the little openings, and what water still remains, will remain until the brush is nearly worn out. This soaking will explain the reason why brushes are condemned as being like "dish rags," etc. You will then say, "How will I swell a brush up that has dried out and got loose?" The answer is this. Wood is the only thing about a brush that will shrink. All that it will be necessary to do is to take two or three teaspoonfuls of water, open the bristles of your brush so as to expose the thick end of the handle, and pour the water directly on the seat of the trouble. Then stand it up with the point of the handle down, and let it stand for an hour or two, and the shrunken wood will have got back to its natural size, and your brush will be ready to bind and put into use. And just here let me advise you not to bind your brushes too tight. The above treatment you will observe is for paint or oval varnish brushes. If you still insist upon soaking brushes, soak them in good linseed oil, which will improve them. Do not adopt the Western idea of putting your brushes to soak with the handle and ferrule covered with water, for if you do, and are using twine-bound brushes, you will have nothing left but a mass of rubbish instead of a brush. Water will burst the twine, and it will not improve even a wire-bound brush in large doses. If the small dose will not swell the brush to its proper size, return it to the manufacturer, for there is not hair enough used to fill the ferrule. I know I have started another train of reasoning in your minds. You will say, "What about brushes used altogether for water or fresco colors?" Metal-bound calcimine brushes need no preparation before using. Put them right into your mixture of whiting, glue, etc., and they will work all right, but if you want to improve on their working qualities, use them to size with once or twice before putting in your calcimine. Use good flake glue for size, as some of the common ground glues in the market form a chemical compound which will rot bristles unless thoroughly cleaned out after using. You will all admit, I think, that it is much harder to get a perfect working brush for water colors than for oil colors. Water is again the seat of the trouble, and the only way out of the difficulty is to get brushes which are made especially for such work. Selected bristles are used in their manufacture and they should be kept for just that purpose. Shellac brushes, if in use every day, should be suspended in the shellac overnight. If only used occasionally, they should be well cleaned out with alcohol before putting away. Varnish brushes, when not in use, are best kept in oil thinned with turpentine. Lettering and striping pencils should have all the color well cleaned out of them and be pointed in oil before putting away. Another of the abuses to which brushes are put is this. When not in use they are thrown indiscriminately into a tub of water, small or large, it makes no difference. Let me advise you to put your brushes in troughs or tubs, so that the points will not touch the bottom of the vessel, and do not suspend them with the ferrules covered with water. It will save you a good deal of annoyance, as well as time and money. You will notice the difference in the working qualities of your brushes at once. Sash tools and fitches will at least have a better shape, and will not "twist" and turn up on the ends. Flat varnish or shellac brushes must not be put in water either before using or while being kept when not in use. All good flat brushes, whether for varnish or shellac, bound with tin, brass or nickel, are invariably "set with glue," and if put in water will get loose and shed hair continually. There is not much lime used at present by painters, but if you have any occasion to use it, see that it has been slaked some time (and the longer the better) before you put your brush in it. Hot lime will destroy the best bristles that can be bought. After you take your brush out of the lime see that every particle is washed out before putting it away for the next job. I read an article some time ago on "Brushes," which appeared in one of the magazines, and which was copied into the SCIENTIFIC AMERICAN and the New York Sun. From the tone of the article I was led to infer that the writer (a painter) would like to have his brushes made with bristles about all of one length, that is they must not contain any short bristles. And further, that if they must contain short bristles ("through the cupidity of the manufacturers"), the brush makers would confer a favor on him and the craft generally by putting the short bristles on the outside. Does he want a stump after he has used but an inch off his brush, or does he want brushes made scientifically, that is, with sev-

\* Read at the recent convention of master painters and decorators of New Jersey, held in Jersey City, July 12 and 13, 1893.

eral lengths of hair in them, so that when his first inch is worn off he starts again with another section of bristles with the soft end on them? Good painters' brushes will still continue to be made with the several lengths of hair in the center. If the short bristles were put on the outside of a brush, there is no

way Plaisance. It is not really a German section of the Chicago Exposition, but a piece of the dear, good "Fatherland" itself that is spread out before the visitor here, surrounded by representative bits of Java, Egypt, and Turkey; so truly German in every respect, even in the smallest details, that one might believe

to the old German original, avoiding all advertisements and novelties, so that there are no signs, even on the heavy oak door that leads to the restaurant. But with remarkable instinct even the Americans discover the purpose of this cool hall finished in Gothic style, and Exposition visitors of the best class usually



THE WORLD'S COLUMBIAN EXPOSITION—OLD VIENNA FROM THE OUTSIDE (EVENING).

painter that could break it in with a good cutting edge, but would wear it to a pencil point. Keep your stock of brushes as far away from your stoves, heaters, etc., in your stores and shops as possible, and on shelves as near the floor as you can. I have found it to be my experience that more brushes are lost from lack of good care than are ever worn out. One thing more before I close. I have been asked how to detect substitutes for bristles in brushes. Tampico or the so-called "whalebone" is the most common adulterant. Pull out a few of the suspected fibers and burn them with a match. If tampico, they will burn with a clear and steady flame, leaving very little ashes and no odor. Bristles being an animal substance containing oil will twist and fizzle in burning and give off a strong odor.

#### THE WORLD'S COLUMBIAN EXPOSITION—THE GERMAN VILLAGE—THE EXHIBIT OF THE UNITED STATES GOVERNMENT.

It is with heartfelt pleasure that one comes upon the German village when wandering through the Mid-

himself transported to a castle village of central Germany. There is no more successful undertaking in the whole Exposition than this German village. Not only the Germans, but also other visitors to Jackson Park, feel as if they were in the midst of old peasant houses, in the shade of the old trees, and before a picturesque German castle, and forgetting many other things that are worth seeing, they return repeatedly for rest and refreshment.

The success of the uncommon undertaking is already assured, and the business management, at the head of which are Dernburg and the well known German-American, C. B. Schmidt, is to be congratulated on this success, which will contribute greatly to the success of German affairs in Chicago. In the Exhibition park proper, as well as in the picturesque annex—the Midway Plaisance—the Teutonic race is so well represented that all other nations are thrown in the shade, as they were in the former (French) Exposition. This time Germany has taken the lead of France.

The largest and most important building in the German village is the fine old castle, with its towers, buttresses and threatening walls surrounded by a ditch. How strange this must seem to the people of Chicago, who are accustomed to the bare stone and iron "sky scrapers" with from one to two dozen stories! And how surprised they must be when they first cross the drawbridge and enter the dark gateway of the castle court! With praiseworthy care they have held closely



IN THE VIENNA VARIETY SHOW.

throng around the oaken tables, desirous of acquainting themselves with the excellent German cooking, and sipping German wines from beautiful rummers. Even the dishes, table cloths and napkins are thoroughly German. The right wing of the castle is



THE WORLD'S COLUMBIAN EXPOSITION—AFTERNOON CONCERT IN THE GERMAN VILLAGE.

entirely filled with highly interesting collections; first, the Germania group, with fifty figures in costume, then in the adjoining rooms the well known collection of arms belonging to Councilman Zschille, of Grossenhain, Saxony. This unusually fine collection, perhaps the largest private collection of the kind, fills several halls and is artistically and picturesquely arranged, forming one of the best exhibits of the whole Exposition, especially for the Americans, to whom it opens an entirely new and unknown epoch, the time of the middle ages. These fine armors, helmets and weapons, these embroideries, saddles, trappings, and household articles, are much admired, and the collection of carving, decorative articles and textile and porcelain wares give us a glimpse of the life of our ancestors.

The other buildings, which form a semicircle around the castle, are also successful reproductions of German structures; as, for instance, the house of Upper Bavaria of 1480, in the original Gothic style, the ale manic house of 1650 of the later renaissance style, the house of Lower Saxony of 1570, and finally the Black Forest house, which, unfortunately, is not yet finished.

The entire western part of the German village is taken up by a large, shady beer and concert garden. Of this we publish an illustration drawn by the skillful hand of our artist, C. Limmer. Two military bands of one hundred picked men in full uniform give concerts twice a day in two different music halls. This is an interesting sight for the Americans, to whom the white coat and bright helmet of the *Gardes-du-Corps* and the uniform of the Prussian infantry guard have been heretofore unknown. A fanfare is blown from the large tower of the castle before the beginning of the concert, while the infantry comes together on the village square and executes the celebrated Berlin "Wachparade." No wonder that this military performance attracts thousands of curious people, who then listen to the concert, while drinking the foaming Würzburger beer.

#### THE EXHIBIT OF THE UNITED STATES GOVERNMENT.

Although the Exposition in Jackson Park is a private undertaking, all of the States of the Union, as well as the United States government, take a prominent part. All have granted sums ranging from \$100,000 to \$1,000,000 for their special buildings and exhibits, thus making the World's Fair twice as large as was originally intended. The most important and interesting exhibit, next to that of the State of Illinois, is that of the United States government. Each department has a special exhibit in the immense iron Government building. All the national collections and Washington museums were plundered, in order to take the most interesting and important objects to Chicago. History, mail and transportation facilities, numismatics, ethnography, natural history, anthropology, all are represented here on a large scale—a speaking proof of the interest that the government of the land takes in the different branches of the administration, but also a speaking proof of the greatness and wealth of this great republic. One might wander all day long in the large rooms of the Government building constantly discovering new objects, and few parts of the Exposition offer so excellent an opportunity to learn the peculiarities of the continent. It is truly an encyclopedia of North America, not devoted exclusively to the present, but also carrying us back to the past. Thus we find here, for example, in the exhibit



UNITED STATES EXHIBIT IN GOVERNMENT BUILDING—AMERICA: THE PRESENT AND THE PAST.



UNITED STATES EXHIBIT IN GOVERNMENT BUILDING—STUFFED WALRUS.



THE WORLD'S COLUMBIAN EXPOSITION—COSTUMES AND MEN OF ALL LANDS.

of the celebrated Smithsonian Institution of Washington, figures of Indians of the different tribes with their original costumes and weapons, as they were at the time of the taking of the continent by the whites. There are busts of the most important chiefs and squaws, two of which have been sketched by the artist. How odd the modern Yankees and their wives look beside these aborigines! What a strange contrast between the faces and costumes of the two races!

The geological is as interesting as the ethnological section, especially for Westerners. Most of the Yankees have for years past known the Indians only through the newspapers, and those who live many hundred miles from the coast are especially interested in the animal life of the sea, and therefore the good negroes look with astonishment at the stuffed walrus and sea lion. But to the European visitor all are interesting; the walrus, the negro, and—the Yankees.—*Ernst v. Hesse-Wartegg, in Illustrirte Zeitung.*

#### THE WORLD'S COLUMBIAN EXPOSITION—THE MACMONNIES FOUNTAIN.

In the Court of Honor of the World's Fair, at the head of the lagoon, is situated the principal fountain in the grounds. The sculptor who designed the foun-

#### NEW WIMSHURST MACHINE.

At a recent meeting of the Physical Society, London, Mr. W. R. Pidgeon and Mr. J. Wimshurst each read a paper on an influence machine, and exhibited their machines in action. In designing his machine, Mr. Pidgeon has endeavored—first, to make the capacity of each sector large when being charged and small when being discharged; second, to prevent leakage from sector to sector as they enter or leave the different fields of induction; and third, to increase the capacity of the machine by making the sectors large and numerous.

The first object is attained by arranging fixed inductors of opposite sign to the sectors near the charging points, and of the same sign near the places of discharge. Objects 2 and 3 are secured by embedding the sectors in wax run in channels in the ebonite disks which form the plates of the machine, and carrying wires from each sector through the ebonite, each wire terminating in a knob. In this way the sectors can be placed much nearer together than otherwise without sparking back. By setting the sectors skew with the radius they are caused to enter the electric fields more gradually; consequently the potential difference between adjacent sectors is kept comparatively small,

fixed between the two movable ones. The sectors are quite small, and neither they nor the inductors are embedded.

On close circuit the machine gives a large current ( $\frac{1}{1000}$  ampere), and on open circuit exceedingly high potentials. In Dr. Lodge's opinion, Mr. Pidgeon attaches too much importance to his sectors and their shape. Mr. J. Gray wrote to say that stationary inductors inclosed in insulating material would probably give trouble at high voltages, because of the surface of the insulator becoming charged with electricity of opposite sign to that on the inductor. He suggested that this might explain why Mr. Pidgeon could not obtain very long sparks. Prof. C. V. Boys inquired as to how far the wax made insulating union with the ebonite, for, if good, glass might possibly be used instead of ebonite. He greatly appreciated the design of Mr. Pidgeon's machine.

#### INTERFERENCE OF ELECTRICAL WAVES.

An important paper by Messrs. Sarasin and De la Rive is published in the *Archives des Sciences Physiques et Naturelles*, and contains, *Nature* says, an account of a series of experiments on the interference of electrical waves after reflection from a metallic screen. The authors being of opinion that the results obtained by Hertz and themselves in a former investigation were vitiated on account of the reflecting surface being too small, undertook this series of experiments, using as a reflecting surface a sheet of zinc 16 meters long and 8 meters high. The arrangement employed was almost the same as that used by Hertz, the spark gap of the oscillator, however, being surrounded by oil. The resonators were circular, and had been used in a previous series of experiments on the propagation of electrical waves along conducting wires, in which it had been found that each resonator responds to waves of a definite wave-length, and to these only. A series of observations, made with a view of ascertaining the minimum size of mirror, which gives consistent results with resonators of different sizes, showed that for a resonator of 75 cm. in diameter the reflecting surface must have a length of from 12 m. to 14 m. and a height of 8 m., while for a resonator of 35 cm. in diameter a mirror of 5 m. long and 3 m. high is sufficient. The results obtained may be summed up as follows: (1) A circular resonator has a constant wave-length to which it responds, whatever be the dimensions of the oscillator, the strength of the induced spark only varies, attaining a maximum value for a certain length of the oscillator, which gives waves in unison with the resonator. (2) The quarter-wave length of a circular resonator is approximately equal to twice its diameter. (3) In the case of normal reflection from a metallic mirror, the first node coincides exactly with the surface of the mirror. (4) The velocity of propagation of the electrical waves is the same in air as along conducting wires.

#### ELECTRICAL CHEMISTRY.

THREE "Tyndall" lectures have lately been delivered at the Royal Institution by Mr. James Swinburne, F.R.S., on "Electricity Applied to Chemistry."

When speaking of the tarnishing of silver by sulphureted hydrogen, the speaker said that it had been found out recently that silver is improved if it be thrown down with a little cadmium; it then turns slightly yellow when exposed for a long time to sulphureted hydrogen; under conditions that will make the pure metal turn twice as black in a much shorter time. Electroplating iron and other metals with cobalt has recently been found to be useful, and has been advocated by Professor Silvanus Thompson, because cobalt does not go yellow, like nickel. A little also has been done lately in electroplating with palladium, a metal which it seems impossible to tarnish. Aluminum can be introduced into mercury to a small extent by electro-deposition.

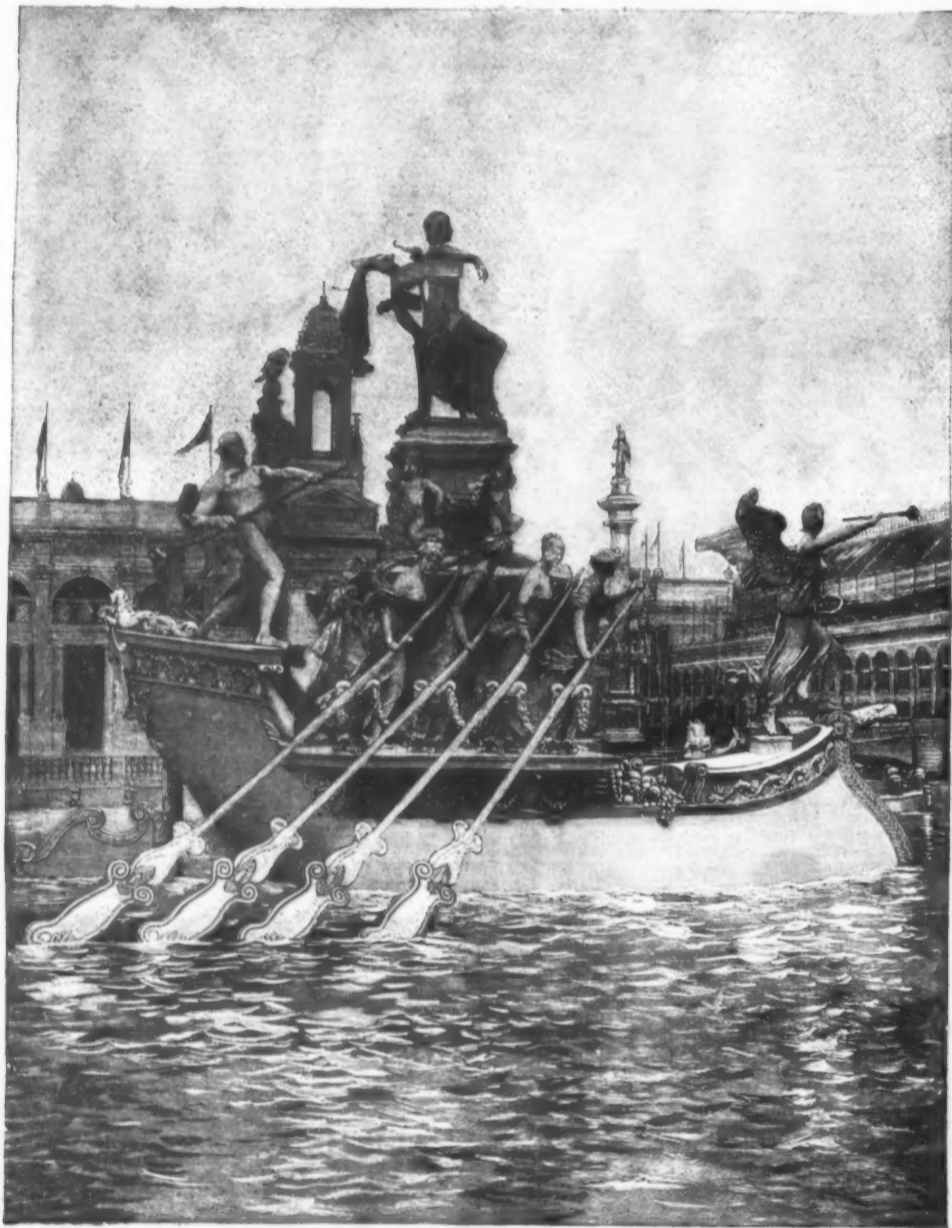
The principle on which tanning by electricity depends is that it makes the tanning substance go through the walls in the cells of the leather more quickly than would otherwise be the case; motion and electricity are used together to quicken the action as much as possible.

When dealing with the subject of the electrolysis of fused salts he made some metallic calcium, one of the most difficult metals to reduce; fused calcium chloride at a white heat was used, and a difficulty is to get any of the metal out of the furnace, as it usually burns away directly any attempt is made at its removal. He also made some lithium, the lightest metal known; it is not so easily oxidized as sodium and potassium, and the specimens which he made burned with a bluish white flame. He showed that molten glass is a fairly good conductor of electricity, and he worked an electrolytic cell, also rang an electric bell by a current which had passed through glass in a state of fusion.

In speaking of electric furnaces he remarked that lime is one of the most infusible substances known; he caused the arc discharge between carbon points to take place in a hole bored through a piece of lime, and showed that the lime all round the arc had been fused somewhat, as if it had been a piece of sugar held in the flame of a candle. Next he somewhat fused chromium, reducing it from the oxide and causing it to aggregate into a kind of cinder; he said that it was a difficult metal to fuse, although not difficult to reduce. He fused some platinum, then tried to do the same with tungsten, and caused it to sinter together into a hard lump; he said that he was not aware that tungsten ever had been sufficiently fused to run into globules. He then reduced some uranium from uranic oxide by means of a little electric furnace, in which a tiny crucible of carbon was mounted upon a cylinder of lime. He remarked that always in reduction in the electric furnace the products are pretty sure to contain impurities, chiefly silicon and carbon.

#### THE LIGHT OF THE ELECTRIC ARC.

At a meeting of the International Society of Electricians, on the 7th of July, M. Violle described the experiments which he had been making on the electric arc. This experimenter has found that the light intensity of the positive carbon remains sensibly constant when the power supplied is varied in the proportion of 1 to 100. He has employed two methods of



THE WORLD'S COLUMBIAN EXPOSITION—MACMONNIES FOUNTAIN.

tain was Mr. Frederick MacMonnies, who executed the sculpture of the fountain in his Paris studio. From the basin rises a mediæval barge; and enthroned above all sits Columbia, the personification of freedom, liberty and power. Father Time acts as helmsman. The barge, which is a reminiscence of an ancient trireme, symbolizes the Ship of State, and is propelled by eight draped female figures representing the arts and sciences, who wield highly decorated sweeps. In the bow stands a glorious winged figure, who proclaims the progress of the nation; this is Fame. The fountain bears the motto: *E pluribus unum* (one out of many). The work is masterly, both in conception and execution; and the sculptor, who is comparatively young, should congratulate himself upon the production of a *chef d'œuvre*. This fountain is one of the triumphs of the Exposition. Pure white, like the rest of the buildings and sculpture, it stands out grandly at night. When the search-light is turned on the fountain, the effect is too wonderful for words. The effect is enhanced when the illuminated fountains on each side burst out in a blaze of glory from the lagoon, where the majestic flight of steps over which the water flows leads up to the majestic barge, the best idea of the marvelous conception can be obtained. The fountain is made of staff and plaster, and cost \$50,000.

Experiment showed that the use of the stationary inductors at the charging points increased the output threefold, and as compared with an ordinary Wimshurst, the output for a given area of plate passing the conductors was as 5.6:1. The recovery of the machine after a spark had occurred was particularly rapid. Mr. Wimshurst's new machine consists of two glass disks 3 ft. 5 in. diameter, mounted about  $\frac{3}{4}$  in. apart on the same spindle. Both plates turn in the same direction. Between the disks are fixed four vertical glass slips over 4 ft. long, two on each side, and each covering about  $\frac{3}{4}$  of a disk. Each slip carries a tinfoil inductor, which has a brush touching lightly on the inside of the adjacent disk on its leading edge. Collecting and neutralizing brushes touch the outsides of the disks and the few metallic sectors attached thereto.

An account of some experiments made to determine the efficiency of the machine was given. The author also showed that when all the circuits of the machine were broken, it still continued to excite itself freely, and sparked from the disks to the hands when brought near. In a written communication, Prof. O. Lodge said his assistant, Mr. E. E. Robinson, constructed a machine on lines similar to Mr. Pidgeon's a few months ago, and had now a large one nearly completed. Mr. Robinson's fixed inductors are carried on a third plate

measurement: that of the spectrophotometer, the accuracy of which is really much greater than is usually stated to be the case; and a second method, due to Arago, employing interference fringes.

M. Violle exhibited a number of photographs of arcs of different candle power in order to show the constancy of the intensity of the positive carbon. By measuring the opacity of the negative plates, these photographs could be used as a gauge of the intensity. M. Violle recalled that this phenomenon had already been investigated by Rosetti, as well as by Captain Abney and Silvanus Thompson, and every one had attributed it to vaporization of the carbon. This opinion was perfectly justified, for the deposit on the negative carbon has the appearance of having been condensed from vapor, and M. Violle had actually been able to produce crystals on this part.

A photograph of an arc produced between carbons of purified retort carbon was next shown, and this exhibited a very curious appearance. Despretz had also observed that the phenomenon was due to volatilization, but that there was fusion of more or less softening of the carbon; he had also attributed the deposit of carbon, which is formed in the arc, to the condensation of vapor of carbon, but he was unable to elucidate the question because he used impure carbons. M. Blondel has recently recognized that impurities in the carbon have not, in practice, any sensible effect on the intensity, which remains constant with carbons of very different quality. The intensity of the arc, he thought, was, therefore, a constant, and it might be

artistic for coal smoke has been such a complete failure is that, when coal came to be burnt as ordinary fuel, the so-called classical style had become completely established, and architects and builders, looking in vain among their Greek temples to find any models for what they wanted, tried to make chimneys look like something else—hence the tall factory chimney became a smoking column, or was concealed within a starved-looking campanile, whereas, in mansions, the chimney pots became vases, and in a house in the neighborhood of Newcastle, we remember seeing nymphs holding up these vases, the smoke from which had blackened their noses and faces in such a manner as to make the goddesses bear a striking resemblance to chimney sweeps, showing that "the truth will out," try to conceal it as you may.

Even in that remarkably fine building by Gandon, the Custom House at Dublin, a silly conceit was had recourse to—the chimney pots are all concealed behind great stone bath-shaped constructions, which when the smoke rises out of them, seem to suggest to the mind vast tureens of Irish stew. Now it seems to us that if, when coal came into general use, the difficulty had been boldly grappled with, we in England might have hit upon some development which would have supplied the want in an artistic manner. We are led to this supposition because the old domestic architecture of this country offers such magnificent examples of the treatment of chimneys. Nothing on the Continent comes anywhere near our great Tudor stacks, such as one sees at East Basham in Norfolk, Sutton Place in

termination which the seventeenth or eighteenth century men have handed down to us is the old-fashioned red chimney pot, which is really thoroughly good in its way; probably it was the most natural and most simple way of meeting a difficulty. It is pleasing in form and good in color, and does not ape at being something else than it really is, and we cannot help expressing a regret that it is now too often given up for those white terra-cotta pots which, when they are new, are of a most unpleasant color, closely resembling underdone pie crust, and when they have been up a few months, look simply shabby and dirty, whereas, the old-fashioned red pot keeps its color well, and its ruddy hue tells out pleasantly against the sky. We do not thank the modern builder for his "improvements," and, of course, the tin and iron abominations, which are set up to cure smoky chimneys, are most unnecessarily ugly.

It is also a very great question whether the modern arrangement of flues and chimneys, bringing them all up together in stacks between the houses, is advisable. Chimneys ought to be allowed to go where they want to go; they are very like pigs; you can drive these animals the way they want to go, but it is very difficult to get them to run in any other direction, and, in all probability, the extraordinary ingenuity displayed by the modern builder in trying to make his chimneys take up unnatural positions too often results not only in an unpicturesque appearance, but in that great nuisance, smoke! It is a question, also, whether the practice of projecting the chimney breast into the



A. Tulor Sack.



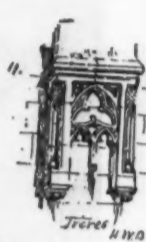
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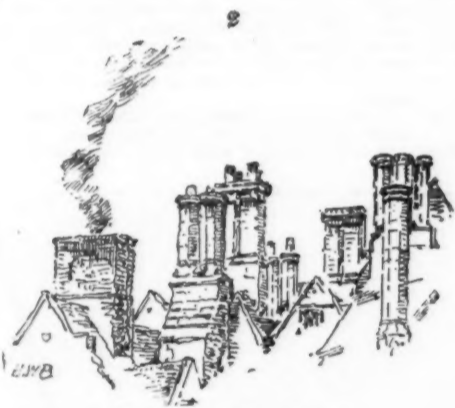
Farm-house at Harrow.



Seligenthal H.W.B.



Trèves H.W.B.



Magdalen College, Oxford.



Harefield H.W.B.



Charter-house H.W.B.



Edinburgh H.W.B.

utilized as such. M. Violle stated, in conclusion, that the temperature of 3,500° C. which is given for the arc ought to be considered as a provisional value, although the true temperature is probably but little different from this figure.

#### THE PICTURESQUE IN CHIMNEYS.

It seems a strange thing that, since the introduction of coal as fuel, little, if anything, has been done in the way of developing the artistic arrangement of chimneys and chimney pots. It would have naturally occurred to the mind that the increased want of space for flues, for heating apparatus, for steam works, mills, etc., would have led to some architectural treatment corresponding to these various requirements. So far, however, from this having been the case, it is precisely in those countries which have retained the old use of wood fuel that we find original and artistic developments of chimneys and their terminations, whereas, wherever coal has come to be used, anything like an artistic development of the chimney seems to have been abandoned.

Among our sketches, Nos. 7, 8, 9 represent chimney terminations from Wurzburg and Zelligen, in Bavaria. They probably date no further back than the last century, and are constructed of tile, brick, and mortar. There are almost endless varieties of this kind of chimney cap to be found in Germany and they serve to show how a perfectly common sense treatment of the means to meet an architectural demand always looks well, when there is no attempt to conceal the object, or make it look like something else; and the reason why, in England, the attempt to construct something

Surrey, Hengrave in Suffolk, etc. (See Fig. 1.) In all our great Tudor mansions, the chimneys are not only ornamentally treated, but are the most ornate features of the whole building. Everything in fact was done to accentuate them, so much so that they are often four or five times as large as there was any necessity for, showing that the architects and builders of the day, so far from regarding the chimney as a difficulty, often fell into exaggeration and exuberance in designing these objects, and even in farmhouses and cottages, where a plain and simple treatment was necessary, what striking features the chimneys and chimney stacks present! Look, for instance, at the group Fig. 3, which crowns the roof of a farmhouse between Harrow and Pinner, those upon a cottage at Harefield, Fig. 4, or even where, as at the backs of Magdalen College, Fig. 2, and the Charter House, Fig. 5, they would seem to be built at random, just wherever they were wanted, what strikingly picturesque groups they form! It does not seem to matter much whether they are costly structures erected of cut brick or ashlar stone, whether they are rough brick work, common rubble, or tile and plaster, they are always picturesque and pleasant to the eye. It may be said: "Yes; this is all very well; but these good men had no factory chimneys or great kilns to deal with." But we may see from the treatment of the kiln, over the bakehouse, or kitchen of the abbey of Seligenthal in Bavaria (see Fig. 10), or that given by M. Viollet-le-Duc from the Abbey of Marmoutier, that they would have been quite capable of grappling with the difficulty in a bold, straightforward way, without attempting to make the sateatures simulate columns or campanile.

Now the only good feature in the way of a chimney

house is a good one; it has some advantages no doubt, but they are more than balanced by its inconveniences.

In the first place it is decidedly ugly, as it cuts into the ceiling and walls of a room in a most awkward manner, but this is nothing to its inconvenience. In a country like this, where people change their place of residence about every three years (we believe statistical returns prove "removals" to be even more frequent), it is of great importance that the form and plan of rooms should be as simple as possible, and angles, projections, nooks, and corners should as much as possible be avoided; now these projecting chimney breasts create four unnecessary angles in every room, leaving two shallow recesses on either side, and it is impossible for any one who has not had the painful experience of many "moves" to realize the trouble which these shallow recesses give one. In the library they are either too small for the bookcases or they are just too large, and in the one difficulty the bookcases have to be cut, whereas in the other two little nooks are left where dust and dirt accumulate. In the dining room, the sideboard never by any chance fits one of them, and the same ill success meets any attempt to make them accommodate drawing room furniture. Carpets have to be cut into or patched to fit them and the angles formed on the ceiling form excellent accommodation for spiders. One advantage in projecting the "breast" outward is that it can, when only required to serve for the flues of upper stories, be corbelled out. At Trèves, in Germany, the chimneys of many of the mediæval houses are carried up the center of the front gable, and supported upon a bold corbel over the shop front; Fig. 11 is an example which dates evidently from the fourteenth century.

The eighteenth century architects were rather fond of carrying their chimney flues over the arches of windows. Fig. 12 is an example taken from an Adams house at Edinburgh. The practice is scarcely one to be recommended, though at times it may be dictated by convenience and necessity.

Whether we shall ever see the tall factory chimney rendered beautiful is a very doubtful matter. Had the thing been taken up from the first and wrestled with in

#### THE BERING SEA FISHERIES.

THE United States of America and Great Britain are giving us an example of political morals that, unfortunately, will not be often imitated. A dispute of great importance having arisen on the subject of the jurisdiction of the United States in Bering Sea and on the measures to be taken to protect the fur seal, the two nations, instead of putting the hand

she ceded Alaska to the United States? Has England admitted the legitimacy of such rights? Are the governments in accord upon the political definition of Bering Sea? Does the transmission of the territorial proprietorship carry with it the maritime sovereignty? Are the seals of Alaska and the Pribyloff Islands, even outside of the limit zone of three miles, still under the protection of the United States?

By a treaty of April 18, 1892, it was decided that



A HERD OF SEALS IN THE PRIBYLOFF ISLANDS.

its infancy, something might and probably would have resulted from the attempt; but it is very difficult to convert an old hardened sinner who has been his own master all through a long ill-spent life. The attempt ought, however, to be made in an honest straightforward manner, treating the ugly monster as a chimney, and not as a tower, column, or minaret. Surely some development of the old designs which have given us such beautiful objects as the old Tudor stacks and the monastic kitchen chimneys ought to result in at any rate something less ugly than what we are in the habit of seeing done.—H. W. B., in *The Builder*.

upon the sword, have pacifically solicited an arbitration.

The tribunal, composed of high personages foreign to the United States, came together at Paris under the presidency of Baron de Courcelles. After studying the numerous documents that elucidate this affair, the tribunal will proceed to pronounce its judgment.

Five principal questions have been submitted to the judges, and upon each of these the latter are requested to render a distinct verdict. The following is a synopsis of them:

What were the recognized rights of Russia when

while awaiting the solution of the question the two nations should use a *modus vivendi* forbidding the capture of the seal in the eastern part of Bering Sea, and limiting the number of the animals slaughtered by the Americans in their Alaskan possessions to 7,500. This treaty reserves equally the question of indemnity to be determined when the decision is rendered and the present *modus vivendi* shall have ended.

Is Bering Sea a particular, interior closed sea? Congress says yes, and the Queen says no!

A few years ago, without its making the least noise



MASSACRE OF THE SEALS.

in Europe, Russia and the United States found their mutual advantage in a friendly transaction, and, on March 30, 1867, a treaty was signed. Russia sold the United States all its territories upon the northwest coast of America, along with the adjacent Aleutian and Pribiloff Islands. As this treaty carried neither

protection of the fisheries in Bering Sea was limited by international law to the zone of three miles.

In the month of August, 1886, the United States revenue cutter Corwin, without previous protestation or warning, seized the British schooners Carolena, Onward, and Thornton, all three of which were engaged

obtained no satisfaction until February 4 of the following year. After this, other seizures were made, and things came to such a degree of acrimony that diplomacy deemed it indispensable to obtain a definitive solution. Thus it was that the tribunal of arbitration was created.



SELECTING VICTIMS.

reserves nor] diplomatic, military or commercial restrictions, the rights of Russia upon land and sea were transferred *in integrata summa* to the purchasing government. However, Great Britain continued to affirm that in the absence of conventions based upon the consent of other nations, the exclusive right of the

in the pelagic seal fishing at more than sixty miles from the nearest land. These vessels were taken to Unalaska. The tribunal of Sitka imposed a heavy fine upon the captains of these vessels and put them in prison. Informed as to this, the English minister at Washington protested against these measures, but

The Pribiloff Islands are one of the principal summer stations of the fur seal, the skin of which is often confounded with that of the otter, so fine and downy is it.

The humid and always foggy and sunless climate is eminently well adapted to it. It is tranquil here, and



CUTTING UP THE ANIMALS.

no one comes to molest it. On the arrival of the seals, which takes place as soon as the rigor of the climate is supportable, they install themselves upon the parts of the shore called "rookeries." There are two kinds of these: those of the reproducing seals surrounded by their "harem," upon the lava and the rocks, and those of the "bachelors," upon the sand of the beach. The continual motion of the animals scarcely permits of counting them. The females go and come and enter the sea.

There are two great bands of seals in Bering Sea. One belongs to the Pribyloff and the other to the Komandorski Islands. According to the Americans, these bands do not intermingle. Their adversaries claim the contrary. They comprise four sorts of seals: (1) bulls or reproductive males, vigorous animals, which, as soon as they reach land, fight ferociously in order to seize the best places upon the rock; (2) cows, females more than a year old; (3) pups, young of both sexes less than a year old; and (4) bachelors, non-reproductive animals of from five to six years of age. The pups are born upon the blocks of lava or the rocks upon which the females land. Parturition occurs in most cases two or three days after the arrival, sometimes at the end of a few hours. The young weigh then six or eight pounds. The color of their very short coat is black, and passes to silvery gray as soon as they begin to take to the sea.

The young seals do not know how to swim. They have to become gradually accustomed to the water, either by entering it to paddle about of themselves or by being carried into it in the mother's jaws. They have great fear of the waves that break into foam, and as soon as they see one approaching, they take to flight in terror, and do not turn around until they have ascended to a very high place above the sea. At the end of fifty or sixty days they unite in small bands and form a school of natation! Under such circumstances it is possible that nature, which is so provident, can have caused the fur seal to be born in an element that may be fatal to it? Some deny this and others affirm it.

The young seal depends closely upon its mother, which alone can suckle it. In her absence no other female would wish to nourish it. Every cow devotes itself to her own pup, and does not desire to receive any other. It follows that if the mother is lost or killed, the little one languishes and dies. This point, like that of the birth on land, is vigorously contested by the English, who recall the fact that most mammals suckle not only other young ones than their own, but also the young of very remote races. There are sluts that rear lions' cubs, adders that suck the teats of cows, and cats that nourish young rabbits.

The reproductive bulls weigh from 550 to 600 pounds when they are five or six years old. They reach the rock toward the end of April, the epoch at which the most element temperature disintegrates and melts the ice. They proceed to the same rookeries without hesitation, select the same post and make an assault upon any usurper that may have had the temerity to install himself in their place.

The cows come on shore in the latter part of May and immediately proceed to join the bulls in the rookeries. The bulls, although very jealous, are polygamous. They have from 15 to 25 females in their "harems," and in some cases, 45 even! While the harem is organized, the male neither eats nor drinks, and does not stir from the harem until the general exodus, which takes place at the end of August, when the rigorous season reappears with its tempests, its blasts and its hoar frost.

The cows are very much smaller than the bulls. They weigh but from 120 to 130 pounds and do not reproduce until they are two years old. Their age has been calculated from the number of litters, of which the maximum is thirteen. Their average duration of life, therefore, does not exceed sixteen years. They give birth to but one young one at a time, and carry that for twelve months. The mothers recognize their pups by their odor and bleating, without ever being deceived. From time to time the cow goes to the sea in order to feed upon fish and calamaries. These absences are longer and longer in measure as the pup gets strength. Moreover, as the season advances, the fish become rare around the islands, and it is necessary for the cow to go very far, sometimes more than 100 miles from the rookeries, in quest of food. She swims rapidly, and accomplishes her outward and homeward voyage in a day.

The "bachelors" reach the rookeries after the bulls, which chase them mercilessly from the rock and force them back as far as to the sand beach. It is the bachelors that are slaughtered, while the bulls, and especially the cows, are never touched. They sleep, roam about, and "go yachting," but are absolutely dis-

claimed by the young cows when they chance to meet one in the course of their maritime and sentimental excursions. They eat very little during their sojourn on the islands. A few days before their departure they mingle with the females, which the exhausted bulls no longer watch over. When, by exception, the weather continues mild and the winter is not severe, the seals remain on the Pribyloff Islands, without emigrating. Evidently, the annual exodus is caused by bad weather, excessive cold, and the difficulty of finding fish. The fur seals of the Gallapagos, very near relatives of those of Alaska, live at the equator and never emigrate. Those of Terra del Fuego, where the snow melts in falling, do not abandon their haunts either.

The Pribyloff seals remain at least five months on these islands and leave them when only forced to do so. They also have their "struggle for existence"! They descend afterward to the south of the Aleutians upon the coast of California; and then, toward February, recommence their rounds in directing themselves anew toward the north.

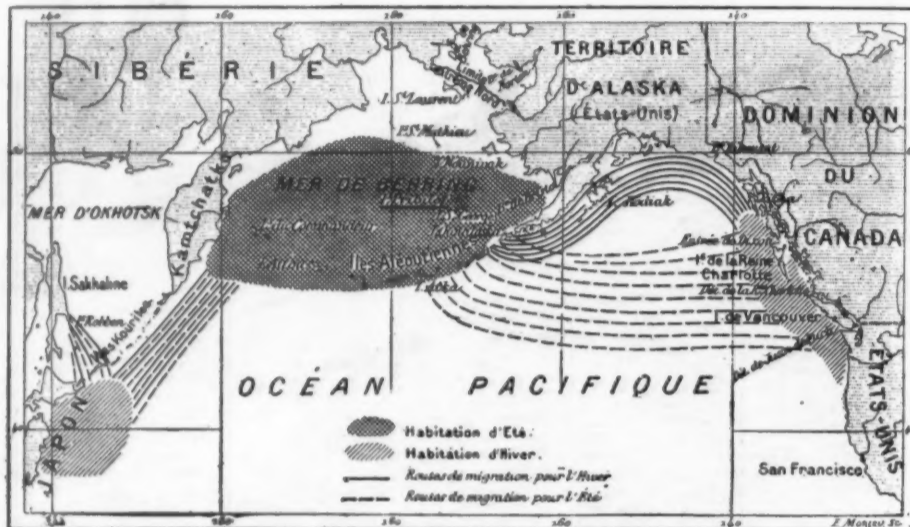
The fur seal has several ways of traveling. When the sea is rough it leaps from one wave to another like the

them and often make their children assist in the lessons of the master. Finally, they wear European clothes and head and foot gear. Captain Bryant, who is well acquainted in these parts, says even that they thrust civilization forward to the extent of blacking their boots!

The Indians, slaves of old, are now treated upon the same footing as the whites. They are free to go whither it seems good to them, but the love of their native soil, as desolate as it may seem to us, keeps them in these icy latitudes. They formerly lived in huts made of driftwood and whale bones miserably huddled up together to prevent death by cold. At present they have comfortable cottages and good stoves.

A characteristic sign is that the women no longer do any heavy work, the men taking this upon themselves. Gallantry has modified the primitive habits of the Esquimaux—of the Aleutians. This great act of civilization appears to us infinitely more laudable than the maintenance of foot gear!

On the Pribyloff Islands the slaughtering is done without difficulty. The animals are selected from



MAP OF LOCALITIES IN THE NORTH PACIFIC FREQUENTED BY SEALS.

porpoise. When pressed, it swims between two waters with such rapidity that few fish can get ahead of it. It often abandons itself to the sea and allows itself to be rocked lazily, rolling and pitching, at the will of the billows. Finally, overcome by somnolence, it curves its tail in the form of an antique stern, and its nose out of water and its belly to the sun, it sleeps profoundly. It is then that the pelagic fishermen approach it and take advantage of it. Are they in the right? Evidently yes, answer the English, because these are wild animals, *fera nature*, belonging to him who captures them or to him who detains them. They feed upon fishes of the open sea and receive no special treatment upon the islands. When the seals are upon the high sea, that is to say, in the free and open sea like the Bering, we have a right to capture and kill them. In the Pribyloffs the Americans have the right to slaughter them. There, the seals belong to them. In the open sea, they belong to everybody!

Owing to its domestic life in the rookeries, the seal is easily watched over. The herd is divided and led as if it were composed of sheep. The sex of the animals is easily made sure of, and it would be possible, were there need of it, to brand them or split one of their ears.

The Commercial Company of Alaska, with a capital of ten millions, is authorized to slaughter sixty thousand "bachelors" annually. This figure may be even reduced without indemnity if the functionary having the interests of the state in charge judges opportune. It was upon such bases that the privilege was renewed in 1890.

The good management of the company has introduced true progress into the material and moral progress of the aborigines of Alaska. They are able to read and write, practice the religion that is taught

among the bachelors, which are led outside of their sand rookeries and delivered to the butcher, who clubs them to death. It is expressly, severely forbidden to disturb the bulls and their harems. A fine is imposed upon ships at anchor if they make too much noise on board.

Near the abattoirs there are works where the skins are salted; after which they are counted, for the tax, in the presence of an agent of the treasury. Finally they are carefully stored.

In measure as the activity of the pelagic hunt has increased, the herd of the Pribyloff Islands has decreased. To the Indians, who are experts, there seems no doubt that the cause of this disaster is the merciless extermination made off the islands by the ships that cruise upon the passage of the seals. It is schooners of from 50 to 200 tons, with a crew of twenty-two men and five or six rowboats that are employed in this hunt. There are often Indians on board mixed with the whites.

The Indian's weapon is a fifteen foot spear, with two movable darts connected with the handle by a very strong line. These spears penetrate the animal, follow it in its agonizing flight and serve to haul it in after its strength is exhausted. Seals are hardly ever lost when the spear is used.

The white man's weapon is the rifle or sporting gun loaded with buckshot. It is calculated that with this weapon less than a quarter of the animals touched are lost. As soon as the seal is wounded it dives and does not appear again, and, if the wound is mortal, it goes to expire in some place very distant from where it was shot. Among the bachelors slaughtered on the islands there are many that bear traces of wounds made by firearms, and the flesh of which contains encysted balls.



ROOKERIES OF THE PRIBYLOFF ISLANDS.

The loss caused by hunting with the gun is already very regrettable, but it becomes disastrous when we find that out of one hundred seals killed with the gun are reckoned eighty females that are gravid or are suckling young at the rookeries. So the mortality of the pups is enormous.

It is demonstrated by statistics that 50,000 skins in the market represent 200,000 animals injured, and consequently 150,000 lost.

If the pelagic hunting is continued in Bering Sea, there will occur in Alaska what has happened at Cape Horn, where shores inhabited of old by the fur seal are now barren. Let us add that the seal fishing schooners, which, in 1879, were but two, with 44 men, were cruising to the number of 46 in 1887, and now form a flotilla of 123 boats manned by 3,000 hunters or sailors!

The English attribute the diminution of the Alaskan herd, not to pelagic hunting, but to an epidemic such as might exist among any other race. This argument merits great attention. Medical examinations alone can confirm the exactitude of it.

Great Britain has taken very rigorous measures for the preservation of the fur seal in her possessions—in the Falklands, in New Zealand and at the Cape. She intends, even, that the common seal shall be respected in her fishery. It is therefore quite natural that the United States also demand that the marine herds shall be protected, not only in the territorial waters (which is something not to be discussed), but even at large, in Bering Sea.

The British government, desirous of protecting so interesting and so productive a race, does not refuse to partake of this way of thinking, but wishes before all else that the question of right be decided, and that the conditions to be imposed upon all flags shall be submitted to a concert of nations. "No monopoly, but a ruling," that is the ultimatum of the English commissioners; while the American commissioners answer: "No pelagic hunting."

At London, the price of a fine seal skin is \$12. It is sold there at a mean profit of \$3. In 1892, the general sale was 130,500 skins of all sources, because the *modus vivendi* authorizes the Alaska Company to slaughter but 7,500 seals. Before that, the Pribyloff skins gave a total of about 100,000 pieces.

French commerce could not be disinterested in the question of the fur seal. It has, in twenty years, bought and made up more than \$2,000,000 worth of Bering Sea skins.

It is well to add that upon the coasts of France, in Flanders and in Brittany, we also have seals, but, unfortunately, they are common ones. Near Dunkirk, at a few miles to the northeast, there is a very remarkable rookery, and one that is little known even among the navigators of this port. It is installed upon a small island that is bare only at low tide. The animals of which it is composed do not allow themselves to be easily approached. As soon as they hear the distant sound of a propeller, they leave the earth and disappear under water. They have doubtless learned to recognize man and know that there is nothing good to be gained from his acquaintance.

The fur seal may be hunted by anybody. There is no need of being an Aleutian or an Eskimau for that. In fact, among the outfitters of the Bering flotilla, we find seven grocers, one druggist, one insurance agent, three business men, one plasterer, one leather merchant, two saloon keepers, and, what does not spoil things, three lovely ladies. There is nothing so attractive to American women as a sealskin dolman or cap.

In order to be better served, perhaps, these ladies serve themselves and fit out ships for the purpose. This is the acme of elegance and fashion.

Such are, in an impartial *résumé*, the data that we have gathered from the best sources, from people of experience and especially from the excellent memoirs submitted to the arbitral tribunal by Mr. Maxwell for Great Britain and Mr. Williams for the United States. These works, as a whole, are very complete and prove the profound erudition of their authors. We are happy to have been able to give an abstract of them at a moment when this distant, almost ignored question is about to be decided at Paris under our eyes.—*L'Illustration*.

#### SEAL HUNTING IN THE BERING SEA.

THE million and a half sterling paid in 1867 by the United States to Russia for the privilege of running up the stars and stripes on the tumbledown block-house "castle" in Sitka, Alaska's diminutive capital, was not a large price to pay for a territory nine times the size of England and Wales. A fraction less than a penny per acre allows a good many of these acres to consist of barren rocks and uninhabitable swamps without making a losing transaction. The events of a quarter of a century have shown that astute Brother Jonathan's last "conquest by the almighty dollar" has, similarly to all the preceding ones, been an eminently good bargain. Some years ago the money already received from a company of San Francisco merchants for the lease of the two tiny Pribyloff Islands—famous, as one knows, because on them are the only remaining breeding places of the fur seal in North or South American waters—had repaid the government of the United States, dollar for dollar, the \$7,200,000 paid for the whole of Alaska and its vast archipelago, which together boast of a coast line greater than the circumference of the globe.

In the solution of few diplomatic questions of modern days has natural history been destined to play such an important role as it would appear bound to do in the settlement of the Bering Sea question, which is now attracting the attention of the world to the fog-mantled littoral of the extreme northwest corner of North America, as well as to the details of seal life, singularly interesting as the latter have always been to zoologists.

The question, often asked, How long will the seal escape the fate of other fur-bearing animals on which fashion has in past times decreed the death sentence? is one to which those who are acquainted with the story of the beaver in North America, and that of the even more precious furred sea otter on the coast of the North Pacific, or who have watched the extreme rapidity with which the almost complete extermination of the American bison was brought about as soon as its skin became a marketable commodity and its

chase even for the sake of its meat a profitable occupation, will hesitate to reply. It is a question in which the trader and trapper as well as the London and Leipzig auctioneer would be more likely to have the last say than the diplomatist, were it not for the well-known peculiarity of this interesting animal to return during every recurring breeding season to the same breeding place—a habit upon which the future preservation of the seal is, of course, primarily dependent. In the case of no other wild animal is the effectual carrying out of protective measures more feasible than with the fur seal.

A rapid glance at the history of fur hunting in the North Pacific is necessary to understand the present position of this industry. In the forty-five years that intervened between the discovery of the Aleutian Islands and the mainland of Northwestern America in 1741 by the Russian navigator Vitus Bering, a Dane by birth (whose name, by the way, the best authorities of his time spell without the *h*), and the discovery of the now famous Pribyloff Islands by the Siberian Cossack of that name, long and adventurous search had been instituted by the daring fur hunters of Siberia for the legendary "Amik," the Eldorado of furs, or, in other words, the breeding grounds of the fur seal, where they well knew the peculiar instincts of that animal led it to congregate in untold numbers during the propagating season. A perusal of the annals of these early explorations, to which Peter the Great gave the first impetus, reveals stories of almost incredible daring. It would be difficult to invent more hopelessly insurmountable obstacles, more repelling experiences, more dread-inspiring surroundings than were faced with the stolid recklessness of the race, and to which the well victualled and carefully outfitted Arctic explorations of modern days afford no parallel. Vast wealth these fur hunters knew would reward the lucky discoverer, and the dangers of the then perfectly unknown North Pacific Ocean, abounding with sunken reefs and dangerous currents, and swept, when not enveloped by fogs, by gales of exceptional severity, were braved by the bold "Promyshlenniki" in craft of the rudest description. Rich indeed were the spoils of Pribyloff when, while drifting with torn sails in the desolate vastness of Bering Sea, he happened, by a sudden lifting of the fog, upon the four tiny mist-enveloped specks of rockbound land, and discovered upon the two largest of the group, the others being mere outlying reefs, vast herds of fur seals. He named the two islands—one of which is thirteen, the other ten miles long—after his two vessels, St. Paul and St. George, and he filled his craft to the top of the hold and crowded the decks with bales of peltry, precious water casks being even thrown overboard (so one historian mentions) to make room for his valuable cargo. Thus freighted, he finally, after an absence of over two years, returned to Siberia's only port, Okhotsk, landing, as one reads, 2,720 sea otter skins—worth at present prices between \$55 and \$80 apiece—8,000 silver and blue fox skins and no fewer than 31,100 fur seal skins, the present value of which need hardly be told to fair readers, and perhaps even less to those of the other sex who are fathers or husbands, but which may be roughly stated as about £3 or £4 apiece before they are dressed.

From that day the depletion of the breeding grounds proceeded at a very rapid rate, and the great Russian Fur Company, of which many great nobles and even members of the Czar's family were partners, realized great wealth. At what enormous rate this depletion proceeded is illustrated by the fact that in one of his dispatches home Baronoff, who in the first decade of the present century was the head of the company, complains of the lack of means of transportation to Siberia, and mentions that in consequence of it 800,000 fur seal skins, which had been faultily stored, had become spoiled and had to be cast away.

In those days it must be remembered, numerous other breeding grounds, situated in the Falkland Islands, Terra del Fuego, New Georgia, South Shetland and many islands on the coast of Chile, now totally exhausted, were still yielding enormous quantities of this pelt, so that the world had then apparently inexhaustible sources of supply at its command; while the excellent hunting grounds on the numerous islands forming the great Aleutian chain, which connects Asia with America as with a string of different-sized pearls, 1,388 miles in length, resting in a graceful curve on the broad bosom of the North Pacific Ocean, furnished to the Russians almost equally vast quantities of sea otter, blue, black and silver fox and other valuable furs from a field which a century's fur hunting has since almost completely exhausted.

Now that the proceedings before the arbitrators in Paris have made the public well acquainted with the more important features of seal life, it is hardly necessary to point out that this interesting pinniped, while assembling in numbers that have been carefully estimated as being between two and four millions on the Pribyloff rookeries, frequents *terra firma* only during three or four months, while the rest of the year is spent by it in the Pacific. Leaving the shallow waters of Bering Sea by the numerous gaps separating the Aleutian chain, which consists of forty large and several hundred small islands, in the early autumn, and following up the vast shoals of candlefish and herrings, the seal seeks the warmer waters along the littoral of North America and Asia, as far south as Central California on the one and Japan on the other side of the Pacific. In spring the return northward toward the breeding grounds on the Pribyloff and on the Commander Islands, which latter are close to the shores of Kamchatka, is resumed, not in great herds, but in small bunches. About the middle of May the "travelers"—i. e., the adult males and the cows in young—commence to show distinct signs of being in a hurry. Separating from the rest, they proceed without rest or stopping toward their wonted breeding ground, while the others continue their migration northward in a far more leisurely manner, reaching the rock-strewn beaches of St. Paul and St. George about a month after the breeding ground proper, in distinction to the so-called "bachelor ground," has become occupied by a seething mass of roaring and fighting seals.

Up to 1867, when the United States acquired Alaska, the Pribyloff breeding grounds were exclusively exploited by the Russian Fur Company, who practically held the whole of vast Alaska in leasehold. Outside of this Russian fur monopoly the fur seal was not

molested by white men, the only non-Russian fur hunters in those days being the Indians dwelling on the western coast of Vancouver Island and Queen Charlotte Islands, whose territory had but recently been made part of the British empire. These Indians are exceedingly expert boatmen, or, rather, canoe men; their craft, entirely different from the Alaska "bidarka," which is made of the skin of the sea lion, is hollowed from one tree, and it is truly marvelous what tempestuous seas such a canoe will ride. Equally wonderful is the unerring seamanship of these breechcloth-clad dusky mariners, who, spite of heavy fogs and perilous tide rips and undercurrents, which are such a dangerous feature of navigation even for large vessels along the northwest coast from Oregon to Bering Sea, will, unassisted by compass, sextant, or chronometer, go out to sea for considerable distances in quest of the young seals which chiefly frequent the coast region while they are on their spring or autumn migration.

In 1866 the first white men engaged in the business of pelagic or open sea sealing, employing Indians to kill the sleeping seals from canoes, which, when game is sighted, are launched from the schooners.

This industry, though prices were then still very low in comparison to those ruling of late years, soon assumed larger dimensions, and in 1892 sixty-five sealing vessels cleared from British Columbian ports, many of which exceeded 100 tons, and manned by more than 1,000 white men and 600 Indians. Their catch, so far as reported to the port authorities, amounted in 1892 to 53,912 fur seal skins.\* The thirty-odd American sealing schooners following the same business bring the total of the so-called fleet of "poachers" to a round hundred. As a rule, the Yankee boats are less successful than the British Columbian, for they find it difficult to obtain Indian hunters, being unacquainted with the scattered Indian settlements on the ironbound and tempest-swept west coast of Vancouver and Queen Charlotte Islands. Since the termination of the first American lease of the Pribyloffs in 1890, the profits of seal "poaching" have been considerably augmented, for previous to 1890 the fur company paid only an annual rent of £11,000, and a tax of \$2.62½ per skin for the 100,000 they had the right to gather each year, while the new lease, now temporarily upset by the *modus vivendi*, reduced the quantity to 60,000 skins per annum, and raised the tax to \$9.62½ per skin, and the annual rent to £12,000; so that, practically, each skin, not counting the cost of procuring it, is taxed £2 2s. 6d., while the "poachers" who roam the North Pacific in quest of their prey are not handicapped by any tax, and in the competition of trade in the great fur markets of London and Leipzig they naturally benefit by this considerable surcharge on the staple produce of the Pribyloff rookeries. The latter skins, being those of animals carefully selected and obtained when the fur is at its prime condition, on the other hand, fetch invariably much more than the skins obtained by pelagic sealing, where more indiscriminate killing is unavoidable. One of the points in the American case, appealing to common sense and one's humane instincts, is the proposed limitation of pelagic sealing, which, so far as the shooting of seals is concerned, is decidedly more wasteful of life and cruel than the killing of selected animals on the rookeries, where they are knocked on the head and no suffering or waste is entailed. White hunters hunting seals in the open sea exclusively shoot the seals, by which numbers are lost, for the aim from a boat or canoe is never very sure, and shot seals, when mortally wounded or killed right out, sink so quickly out of sight that it is not always easy to secure the body. Far preferable is the Indian method—i. e., harpooning them. This, however, requires more skill, for it is no easy thing to get close enough to the sleeping or resting victim, and the throwing of the spear, attached to which is a line, from a crank canoe requires long practice. As a rule, too, the Indians use more discrimination in the selection of their quarry, and it is not too much to say that were the exploitation of seal life in the North Pacific left to them alone, the provisions now becoming urgently necessary to prevent the extinction of this animal would be as superfluous as similar regulations were unnecessary in order to preserve the once equally numerous herds of bison so long as the white man was not dominant on the plains of the West.

Want of space prohibits one's entering into the many interesting features of seal life and seal hunting, with the details of which a long residence on the Pacific coast has made one acquainted, and equally impossible is it, from the same cause, to give a disinterested outsider's view of the merits of the respective cases advanced by the two countries.

#### FISH MONSTROSITIES.

WEBER showed some years ago that the eggs of the common pike could be caused to produce double monstrosities if the recently fertilized ova were violently shaken. Mr. John A. Ryder has recently communicated a paper to the Academy of Natural Sciences of Philadelphia, which leads to the belief that the Japanese produced their singular breeds of double-tailed goldfishes by taking the eggs of the normal species of goldfishes and shaking them, or disturbing them in some way, as Prof. Weber did with the eggs of the pike. They would thus obtain some complete double monsters, some with two heads and a single tail, and some with double tails. Those most likely to survive would be those with only a duplication of the tail. These being selected and bred would probably hand down the tendency to reproduce the double tail, a tendency which could become fixed and characteristic if judicious selection were maintained. Mr. Ryder thinks that his investigation warrants the conclusion that the regenerative power of organisms disappears as we rise in the scale of organization, last of all in the peripheral extremities. He further observes that the power to produce monstrosities or congenital aberrations of development, due to external disturbances of segmentation during growth, diminishes in the higher forms *pari passu* with the advance in development.

\* The bluebooks recently published do not give later data than those of 1891; these figures, therefore, are the latest.

INFLUENCE OF MUSIC ON MAN AND ANIMALS.\*

THE most perfect musical instrument, and at the same time the most ancient, is the one with which every human being is endowed, the lungs, the trachea, the larynx, and the mouth. It seems that all races and nations possessing forever this musical instrument should be capable of producing the greatest possible variety of sounds and their combinations. One could believe on the same ground that all men are able to use this musical instrument to some degree of perfect-

is induced. Such change of feeling is effected not only by such pieces as *Stabat Mater* of Pergolesi and *Requiem* of Mozart, but even by bells tolling; when funeral tolling is sounded we hear the very brass weeping over the one departed *ad patres*.

It is self-evident that the music operates on the heart and blood vessels. This can be proved by a series of experiments. In experiments with some animals the manometer is placed on the very artery, when the contraction of the artery is noticed by vacillations of the index in the manometer. By a certain device the index of the manometer may trace a curved line on paper

By means of this apparatus we may study the action of the heart, the rate, force, and regularity of its palpitation, and also increased or decreased fluxion of the blood in the arm, and moreover changes in the respiration of a man who sits quietly and whose arm remains in the same position.

Then producing different sounds and melodies in turn, whether by tuning fork or violin or some other musical instrument, we may study the influence of these sounds on the heart's action and in general on the circulation of blood. Thus we shall find that the rate of the heart's palpitation either is increased or decreased, as it is shown on Plate III., Figs. 16, 17, 18, and 19, where the pulse and the blood pressure are represented by a curved line. Thus, for instance, sound Mi 3 of a tuning fork has less influence on the blood circulation than sound Mi 4; the same is true as to sounds Sol 3 and Sol 4 (Plate III., Figs. 18 and 19). The like effect was noticed in another subject with Sol 3, Sol 4, and Mi 4 of tuning fork (Figs. 20, 21, and 22). Changes in the heart's action and the blood pressure are produced not only by different sounds, but even by the same sounds of various force, when they are increased by corresponding sounding boards. Moreover, the same changes are noticeable when the same melody is played on different instruments, violin, flute, clarinet, or small flute. Therefore, when examining the influence of music on the circulation of blood, it is necessary to pay attention not only to the height and force of a tone, but also to the character of the sound wave, in other words, to the kind of the musical instrument played on.

That the music acts differently on different subjects I am convinced, in that by my experiments with different men. And the nationality of the subject has much to do in this case. In my office I had a Tartar whose circulation of blood underwent the greatest changes when Tartar melodies were played, as it is shown on Plate III., Fig. 23.

That the music has effect on the heart and the vasomotor nerves of the animals, I will cite here three experiments, made by me, two experiments with a dog and one with a rabbit.

**Experiment 1.**—The carotid artery of a small dog (pincher) was connected with the manometer of a rotating drum (cymnograph) for tracing a line showing the palpitation of heart (as explained above). The rate of the heart beating was determined by a chronometer for a unit of time—10 seconds. The auditory nerve was acted upon by whistling. In order to prevent a muscular contraction in the animal, the latter was poisoned by *curare*, when the circulation of blood continues if the respiration is kept up artificially. The results of the experiment were as follows:

Number of observations.	Rate of pulse in 10 seconds.			Blood pressure, mm. in manometer			Notes.
	Prior to	During	Soon after	Prior to	During	Soon after	
	Whistling.			Whistling.			
1	30	23	22	130	204	128	Animal quiet and not poisoned by curare. Curare poisoned. Artificial respiration. One mgrm. of strychnia was injected into a vein and in 10 seconds the experiment was made.
2	35	40	37	178	222	219	
3	32	39	37	204	214	214	

**Experiment 2.**—A small dog (pincher). The carotid artery was connected with the manometer of cymnograph. The auditory nerve was affected by whistling.

Number of observations.	Rate of pulse in 10 seconds.			Blood pressure in mm. in manometer.		Notes.
	Prior to	During	Soon after	Prior to	During	
	Whistling.			Whistling.		
1	21	25	—	142	146	{ Animal quiet. Was not poisoned by curare. Poisoned by curare. Artificial respiration.
2	24	19	—	148	156	
3	14	16	17	131	133	
4	15	17	—	138	139	
5	17	19	—	127	130	

**Experiment 3.**—White rabbit. The carotid artery was connected with the manometer of cymnograph. The hearing was irritated by whistling.

Number of observations.	Rate of pulse in 10 seconds.		Blood pressure in mm. of manometer.		Notes.
	Prior to	During	Prior to	During	
	Whistling.		Whistling.		
1	46	50	114	150	{ Animal quiet and not poisoned by curare. Poisoned by curare. Artificial respiration.
	48	49	112	146	
	36	40	132	140	

It appears that the rate of pulse is increased by whistling, particularly when the animal was previously poisoned with strychnia, that is, when the nervous irritability is increased. The long continued and strong whistling produces a contraction of muscles of the body, diminution of the heart beating and increasing of the heart's contraction. Sometimes the heart beating becomes irregular. In all my experiments with dogs, rabbits and cats, the increase in the heart's pulsation reaches from six to fifty per minute. Not all dogs show the same rate of increase of pulsation under the influence of whistling; pincher proved to be more susceptible than the dogs of other families. Rabbits

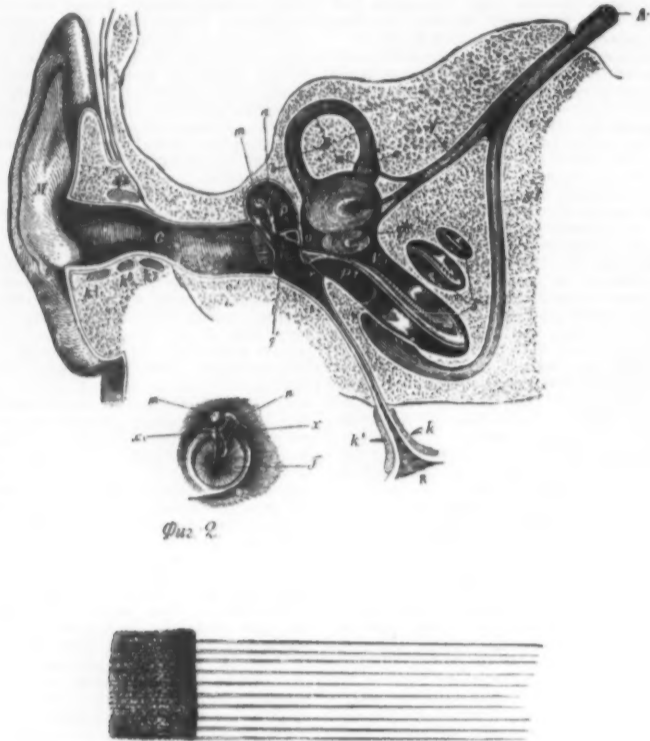


PLATE I.—SCHEMATIC SECTION OF THE RIGHT HUMAN EAR.

tion; but, as everybody knows, this is not the fact. Therefore, besides the hearing apparatus and the musical instrument which, from the physical standpoint, does not materially differ from the musical tubes provided with tongues, from two to four octaves, the intellectual or spiritual power of man is required in order to understand and develop the musical art. As not all men are equally developed, not all of them equally comprehend the music. As to understanding the music, the inhabitants of Europe surpass all, but even they present different degrees of musical development. And here, too, we find the reason for existence of natural melodies and songs. In Chopin's music you will know a Pole, in Mendelssohn's a Hebrew, and in Glinka's operas a Russian.

The music has a powerful influence on man and animals; it effects the contraction of muscles and operates on the nervous system. The respiration, too, is either accelerated or retarded, depending on the character of music, whether *allegro* or *andante*. In consequence of such action of the music on the organism, the spiritual or mental condition of man is also changed. Change *dur* for *mol* with slow tempo, and you will notice that the respiration becomes slower and deeper, the muscles get relaxed and a melancholy disposition

wound on a roller, thus the very heart and its blood disclose the mystery of their life. But such experiments cannot be made with man, therefore some devices were resorted to, by means of which, without any bloody operation, we may study the action of the heart and the distribution of blood in our organism. One of such devices shown in drawing was used by me to show the influence of the music on man. (Plate II.)

This device consists of the following arrangement. A man's arm is introduced into a glass cylinder, through a rubber sleeve; then the cylinder is filled with water from another vessel containing water. The water of the cylinder, by means of a metallic tube with a faucet, a rubber tube and an elastic drum acts upon a very sensitive lever. By means of the faucet in the metallic tube we may prevent the water of the cylinder from transmitting its vacillation, prior to the experiment, to the drum and the lever. The presence of the water in the cylinder is regulated by raising or lowering another vessel with water connected with the former. The very sensitive lever touches upon the sooty paper wound on a rotating drum. When everything is ready the faucet is (opened) turned, and the water of the cylinder acts upon the drum and the lever. The increased or decreased circulation of the blood in the arm will affect the action of the lever, whose traces will be found on the paper.

\* A lecture by Prof. J. M. Dogiel, of the University of Kazan, Russia.

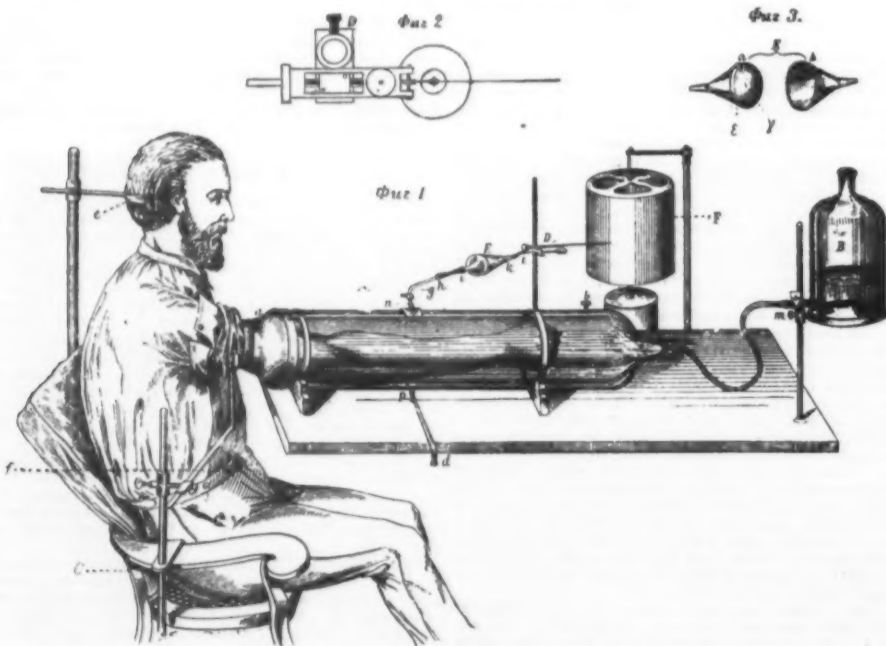


PLATE II.—DR. DOGIEL'S APPARATUS—PLETISMOGRAPH—FOR INDICATING THE INFLUENCE OF MUSIC ON MAN.

are more irritable than dogs as far as hearing is concerned.

The blood pressure is different under the influence of different tones and sounds of various force and height. Different animals are differently affected, as it is shown by the curved lines on Plate III, Figs. 4, 5, 6, 7 and 8.

If a rabbit be poisoned with curare and his respiration be sustained artificially in order to prevent any muscular contraction, even then the blood pressure is increased by whistling, though not to such a degree as in a rabbit not poisoned. In a cat the blood pressure during whistling at first is increased, then it is decreased (Figs. 9, 10 and 11). If we inject strychnia (1 milligramme) the blood pressure and pulse increase (Fig. 11). All the experiments made by me with animals in order to show the effect of sounds prove that their heart beating and circulation of blood sustain the same changes as man.

Strychnia and some other poisons increase the irritability of the auditory nerve; on the contrary, spirituous liquors and opium in large doses decrease the effect of musical sounds on the blood circulation. Curare decreases somewhat the effect of sounds. Still the circulation of blood undergoes some changes even in the animals poisoned by it. It is exceedingly interesting to study the influence of music on animals poisoned with curare, because the animal then cannot move and the respiration sustained artificially can be stopped at our will, and the experiment proves clearly that the changes in the blood circulation are produced under the influence of sounds, independently of the muscular contraction, the motion and respiration of the animal.

therefore the sound waves and the light waves resemble each other. And indeed in light, as in music, there is principal tone, force and character. There can be a light scale, transition of one color into another, as there is a musical gamut. Though there is a resemblance between the light and the sound, yet there is a great difference between them. The highest note of a flute, *Re*, is equal to 4,752 vibrations per second, while the sensation of red color is produced by 407 billions of vibrations per second. An experienced musical ear can distinguish all notes and their character in an orchestra, but the most sensitive eye cannot distinguish the primary colors in a compound one. Harmony of sounds gives an idea of time, while harmony of colors, that of space; therefore music has its own field, and we cannot expect from it what it cannot give us. Music sometimes is divided into descriptive, imitative, etc. This is wrong. One can make as many trills on a flute as he likes, yet we will not get a nightingale's song. Flute will remain a flute, and nightingale a nightingale. Meyerbeer in the second act of the *Prophet* tried to imitate the galloping horses, and he failed most evidently.

Haydn, in his *Creation of the World*, tried to imitate what it is impossible to imitate, chaos for instance. When they tune their instruments there is a musical chaos, perhaps, but there is neither harmony nor idea of a chaos of creation. One hardly can comprehend the struggle going on between a mother and her son in Beethoven's *Overture to Coriolanus*.

We must admit that music has a peculiar effect on man, and that it acts on his brain; therefore it must have some influence on the spiritual condition of man.

music will rather do harm, as such patients cannot bear, not only playing and singing, but even loud talking. However, I firmly believe that as music has a great effect on the vaso motor nerves and the muscular system, it will prove a powerful means in the hands of learned physicians.

Music must not be regarded only as a therapeutical means, or as a means of amusement for the idle people. It is one of the most powerful means of education of children. The ancient Greeks understood that effect of music. Plato made it a rule that all youths from thirteen to sixteen years for three years studied music; and Aristotle held the same opinion. If sciences are necessary for the development of the intellect, the arts, painting and music particularly, are necessary for education of our feelings.

Harmony in music is like symmetry in architecture; the one is expressed in time, and the other in space. We like both harmony in sounds and symmetry in architecture. If it could be possible to solidify or petrify the musical waves of some great musical composition, then we should behold a remarkable symmetry in the arrangements of musical waves. Music develops in youths, imperceptibly for themselves, a certain harmony of feelings; it softens the strong animal passions and thus ennobles them, and develops love for everything beautiful. Music kindles in the soul of youth that sacred fire which is essential for the life of individuals and nations. The materialistic tendency of our times perhaps can be explained by deficient study of painting and music in our middle and high schools. True, the one-sided and excessive study of music may do harm by consuming too much time

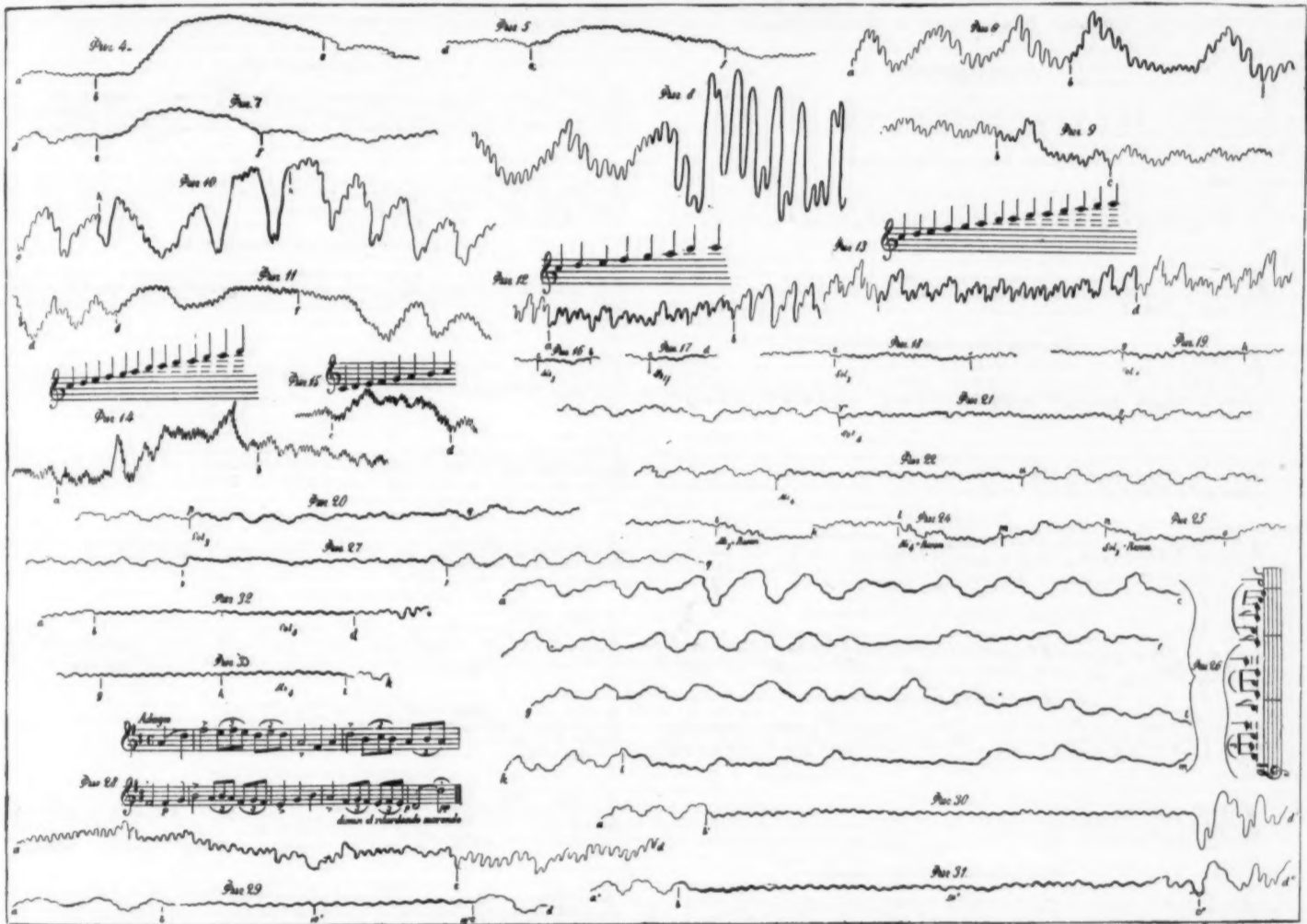


PLATE III.—DR. DOGIEL'S EXPERIMENTS—THE INFLUENCE OF MUSIC ON MAN AND ANIMALS.

Fig. 4. Rabbit not poisoned; before, during, and after whistling. 5. Ditto, but poisoned with curare. 6. Blood pressure, heart contraction, and respiration of dog as in 4 and 5. 7. Same as 6, with faint whistling. 8. Ditto, with loud whistling. 9. Cat with whistling. 10. Ditto, with a strong and prolonged whistling. 11. Cat poisoned by strychnia; whistling faint. 12. Dog during flute playing second octave. 13. Same dog, flute playing second and third octaves. 14. Cat, not poisoned, while clarinet plays second and third octaves. 15. Same cat, clarinet playing first octave. 16 to 27. These lines were made by plethysmograph in experiments on man. 16 to 25. Blood pressure and respiration during tuning fork sounds *Mi* 3, *Sol* 3, *Mi* 4, *Sol* 4, with and without sounding board. 26. During the play of Standchen von Schubert on violin A B C, on clarinet D E F, on flute G H I, and on piccolo K L M. B E H I show the beginning of playing. 27. During a whistle, O P. 28. Blood pressure and respiration of Garif, a Tartar, before, during, and after the playing of a Tartar melody. 29. Before, during, and after respiration; Tartar. 30. Ditto, breath held 40 seconds. 31. Ditto, breath held 50 seconds. 32. Man; circulation of blood before, in, and after breath being held. While held, hearing was irritated by *Sol* 4 of tuning fork. 33. Ditto, tuning fork sounding *Mi* 4 H I. I K after breath was drawn.

It is evident then that music affects the heart and the vaso-motor nerves in man and animals. This influence can be explained on one side by the effect of sounds on the peripheral filaments of the auditory nerve in the ear, and on the other side by the effect on the brain, medulla oblongata directing the heart's action and the vaso-motor nerves.

If we know that music has influence on the nervous system, the muscular contraction, the heart and blood vessels, then why should not we use music in treatment of mental disorders of man? Why should music not be used in schools to improve our children? We should study more as to the effects of music on man and animals. J. J. Rousseau thus defined music: "Art de combiner les sons d'une manière agréable à l'oreille." (The art to combine the sound in a manner agreeable to the ear.) Kant said: "Music is the art of expressing in sounds the pleasing series of feelings." Hanslick, professor of the University of Vienna, said that "Music is a language which we understand and in which we talk and which nevertheless we cannot translate."

In the opinion of the same Prof. Hanslick, all arts affect our senses, but the influence of music is a peculiar one, having nothing common with the other arts. In painting and ornaments, we experience an agreeable or disagreeable sensation, harmony or disharmony;

We know from the Bible that music was used in treatment of a disease, when David tried to alleviate the sufferings of Saul. The ancient Greeks also resorted to music for treatment of diseases. As Quintilianus asserted, Pythagoras advocated music as a therapeutical means; and his advice was followed in all parts of Greece where his teaching was accepted. In Italy, the classical country of music, the insane are treated with music in the hospitals of Reggio and Perugia. The well known French physiologist, Magendie, found music useful in treatment of some nervous disorders among the deaf and dumb, and the epileptic. It appears from the letters of Leuvalis to Berlioz, that music had good effect on insane in the hospital of Auxerre, France, and also in *Hospice de la Madeleine* of Boury, in Halle, Germany, and in other places. Esquirol observed a treatment with music in the hospital for insane in Charanton, though with small success. In his work, "Des Maladies Mentales," vol. ii, p. 538, Paris, 1838, he said: "Music has a calming effect on insane when they are excited, but it cannot cure them." In the period of recovery it has a very beneficial effect. Many physicians expressed their opinion to the effect that music's influence soon passed away and therefore it cannot be relied upon. Of course, as a therapeutical means, music can have a good effect only where it is properly used. With the nervous, irritable patient

and developing certain emotions. But in education, as in everything else, order and harmony must be strictly observed.

Plate I.—Fig. 1. M, external ear; G, auditory canal; *k*2, *k*3, *k*4, *k*5, sections of cartilage; G consists partly of cartilage and partly of bone; T, membrane of drum or tympanum; P, cavity of tympanum; O, fenestra ovalis; r, fenestra rotunda or round opening; between T and O are the auditory ossicles; R, Eustachian tube; *k* and *k'*, sections of cartilage; V, B, S, labyrinth; V, vestibule; B, semicircular canal with ampulla (*a*), the other two semicircular canals are hidden; S, cochlea with spiral lamina going to scala vestibule, V, *t*, and to scala tympani, P, *t*; 1, 1', b, pericostum internum; 1, spherical sac; b, semicircular canal with ampulla (*a*); A, auditory nerve which divides into two branches, V', which goes to the vestibule and the semicircular canals; and S', the nerve entering at the base of the cochlea through minute foramina and distributed to the rods of corti and the auditory hairs.

Fig. 2. The membrane of the drum of the ear seen from within: M is the malleus or hammer bone; N is the anvil bone incus. The membrane is stretched and the hammer and the anvil are in their natural position, which covers the stirrup bone (Fig. 12) or stapes. The line, X and X', shows the axis of motion of the hammer and anvil.

The unmarked figure shows the auditory hairs, of which there are estimated to be some 30,000, and which are deemed to be the final media of communicating sounds to the ultimate distributions of the auditory nerve.

Plate II.—Fig. 1. Apparatus—pletismograph—for examination of the circulation of blood in man. A, glass cylinder; B, glass vessel connected with the glass cylinder by means of a rubber tube, *cm*. C, chair, with the head support *e*, and arm, *f*, in position. One end of the glass cylinder is connected with a rubber sleeve, *a*, through which the arm is passed into the cylinder; *g*, metallic tube with *n*, a faucet, screwed in the metallic screw nut inserted in the cylinder. E, elastic drum dividing two funnels, of which one is connected with the metallic tube, *g*, by means of a rubber tube, *hi*, and the other end of the second funnel is connected by means of a rubber tube, *kl*, with König's drum, whose elastic film is connected with a very sensitive lever, D. Metallic tube, *pd*, serves for emptying water from the cylinder. After the experiment and during the experiment this tube is closed with metallic cork, *d*; *b*, metallic tube by means of which the air bubbles can be removed from the cylinder when it is filled with water.

Fig. 2. König's drum with elastic film and lever. Fig. 3. E, two funnels of glass, *a* and *b*; funnel, *a*, to which is attached elastic film, against which is placed the wide end of another funnel, *b*. F, roller with a clockwork by which the roller is regularly rotated, on which a paper is wound. This paper is then smoked, in order to trace on paper the line made by vacillation of water caused by blood pressure in the arm of the subject.

Plate III.—Fig. 4, line *abc* shows blood pressure in

Figs. 16-26 show blood pressure and respiration under the influence of tuning fork sounds Mi 3, Sol 3, Mi 4, Sol 4, with and without sounding board.

Fig. 26. Lines by pletismograph during the playing of an air (Stanchen von Schubert) in Mi 3 on violin, *abc*, on clarinet, *def*, on flute, *ghi*, and piccolo, *klm*. *b*, *c*, *h*, *i*, show the beginning of playing.

Fig. 27. The curved line, *nopq*, made by pletismograph in a man, during a whistle, *op*.

Fig. 28. Curved line, *abc*, shows blood pressure and respiration of Garif University servant, a Tartar, prior to, *ab*, during, *bc*, and after the playing of a Tartar melody.

Fig. 29. Curved line of man prior to, *ab*, during, *bc*, and after, *cd*, stopping and resuming respiration.

Fig. 30. The same line with difference that the respiration was retained for 40', *b'c'*.

Fig. 31. The same line. The respiration was retained for 50', *b'c'*.

Fig. 32. The line shows the circulation of blood in man prior to, *ab*, during, *bc*, and after, *cd*, the retention of respiration. Respiration was stopped, *cd*, and the hearing was irritated by the sound Sol 4 of tuning fork.

Fig. 33. Similar line, prior to, *fg*, and during, *gh*, the retention of respiration; the hearing was affected by the sound Mi 4, *hi*, of a tuning fork, and lastly after the respiration was resumed, *ik*.

Plate IV.—1. A song of Karais. 2. A song of black Karais. 3. A song of natives of Polynesia. 4. A song of natives of New Zealand. 5. A song of negroes of Fanti tribe. 6. A song of negroes of Ashanti tribe. 7. A song of Finns of olden times. 8. A Chinese air. 9. Ancient Egyptian sacred melody. 10. A melody of Kourds, diatonic. 11. A melody of Kourds, chromatic.

## RUBBER IN SIERRA LEONE.

By G. F. SCOTT ELLIOT.

THE rubber exported from West Africa is of two kinds. One is derived from the so-called rubber vines, which appear to be all species of *Landolphia* or *Carpodinus*; the other is derived from a tree, *Ficus Vogelii*, and possibly also from other species of fig. The most important kinds in the district through which we passed, "Oro," "Djenge," "Fura," and "Genye" (all rubber vines), were found in old forests, and the amount existing at present cannot be large. The natives have long since cleared the land of the original primeval forest in all the parts below 1,000 feet, and the country is either under cultivation for cassava or is covered by grass or bush from three to ten or twelve years old.

The natives seem in most districts usually to make a fresh clearing after the bush has attained this age, and consequently these kinds of rubber do not get a chance of growing, as they all, so far as I have seen personally, prefer old forests where the trees are at least twenty years old, and the soil consists of a rich, moist humus, or is, at any rate, a mixture of leaf mould and other soils. On the other hand, on the plateaux of iron pan and gneiss from 1,000 feet upward to 3,000 feet, the trees, though numerous and in large part of considerable age, are too isolated, and the soil is too dry and hard for these rubbers. In fact, the amount of rubber available from the rubber vines depends on the amount of original forest, and this is not large in the district we traversed.

On the other hand, there are enormous areas from which rubber could be obtained, provided the district was freed from the never ceasing native wars and slave



PLATE IV.—DR. DOGIEL'S EXPERIMENTS—THE INFLUENCE OF MUSIC ON MAN AND ANIMALS.

not poisoned rabbit prior to, *ab*, and during, *bc*, a whistling sound.

Fig. 5. Curved line, *def*, shows blood pressure of the same rabbit, but poisoned with curare, prior to, *de*, and during, *ef*, whistling sound.

Fig. 6. Curved line, *abc*, shows blood pressure, contraction of the heart and respiration of a dog, rat catcher, prior to, *ab*, and during the irritation of the hearing with whistling.

Fig. 7. Line, *def*, shows blood pressure, heart contraction and respiration of a dog, pincher, prior to, *de*, and during a faint whistling, *ef*.

Fig. 8. Similar line of a dog not poisoned prior to and during a loud whistling.

Fig. 9. Line shows blood pressure and respiration in cat not poisoned prior to, *ab*, and during whistling, *bc*.

Fig. 10. Similar line of the same cat prior to, *gh*, and during, *hi*, a strong and prolonged whistling.

Fig. 11. Line of the same cat poisoned with strychnia (0.001 gramme injected into the femoral vein) prior to, *de*, and during a faint whistling, *ab*.

Fig. 12. Line shows blood pressure and heart beating, and respiration of a dog, pincher, during, *ab*, flute playing, second octave.

Fig. 13. Same line of the same dog (not poisoned) during, *cd*, flute playing second and third octave.

Fig. 14. Line showing blood pressure and respiration of a cat, not poisoned, during, *ab*, clarinet playing second and third octave.

Fig. 15. Line of same cat during, *cd*, clarinet playing first octave.

Figs. 16-27. These lines are made by pletismograph during experiments with a man.

Additional Remarks.—Not everybody is affected by the same music in the same manner. During performance of an opera some are very excited, others are very attentive, some are quite indifferent, and some yawn or talk on a topic that has nothing to do with the opera. There are some who are unpleasantly affected. In some persons, therefore, music excites the nervous system and in others it rather depresses it.

Pietro del Castelnuovo, a famous singer of the thirteenth century in Italy, was detained by robbers, who intended to kill him. He began to sing and produced such an effect on the robbers that they left him alone.

Alessandro Stradella, born in Naples in 1645, though not good looking, had a profound effect on all those who heard him sing. Estella, a daughter of a notable of Venice, heard him, and though she was betrothed to a noble, fell in love with Stradella and married him in spite of her parents' protest. Murderers were sent after Stradella, but they were disarmed by hearing him sing. In the third attempt the murderers were successful and they killed their victim.

Soldiers know that music adds to their courage so much that they disregard all dangers.

When the French army under Napoleon I. were crossing the Alps and the soldiers were perfectly exhausted by pulling up the cannon and refused to do the work any longer, Napoleon ordered Marseillaise to be played, and the soldiers with renewed efforts accomplished their task.

Music has influence in digestion. Ancient Greeks subdivided music: Phrygian, exciting courage and valor; Lydian, melancholy and anguish; Eolian, a blissful condition; Dorian, solemn, religious feeling.

raiding expeditions. Thus the country about Laya and Kofu Mountain, as well as the Benna country, along the edge of which we passed, is full of forests and contains much rubber which would, if the roads to Kambila were safe, pass down the Searies River. The Fula country, lying back from the northwest corner of the English sphere of influence, is also said to be full of rubber, which would most probably come down the same way.

Along the tenth degree of north latitude the country is in many places broken and mountainous, and the deeper and narrower valleys are full of dense forest, from which the rubber could be profitably withdrawn. There is also in all probability an enormous supply in the almost uninhabited Koronko district, and in the magnificent woody valleys about Bafodeya and other parts of the Limba country, on the Upper Rokelle and especially in the back country of Sherboro. I should think it probable that with roads made absolutely safe, the supply of rubber from the colony might be doubled, or even quadrupled in amount, but with the development of lawlessness and the constant native wars everywhere, but little is to be expected after the next few years, when the sources readily reached from the coast have been drained of their supplies. It must also be remembered that the supply is one which is likely to be exhausted with increase of population, and ought not to be reckoned upon for more than a few years, supposing the country were rendered safe.

This, however, only applies to the above-mentioned kinds, and does not affect the supply derived from *Landolphia florida* and the other species of *Carpodinus*. These latter plants were found in fairly open

dry ground, at from 1,000 to 3,500 feet, and are probably very abundant everywhere. The rubber yielded by them is neither so good nor so abundant as that from the above-mentioned kinds, though probably it could be immensely improved by better means of extraction.

With regard to the rubber from trees, I only found *Ficus Vogelii* once in the Niger drainage area; this is the kind found at Bassa and lower down the coast. There are about thirty-nine specimens of *Ficus* sorts in my collection, and it is of course possible that several of these yield rubber, but the only other species of which I heard this is a new species. On the whole the supply existing in the country we traversed cannot be considered as of great importance.—Colonial Report.

#### ICE IN THE TREATMENT OF ACUTE PNEUMONIA—A COLLECTIVE REPORT.

By THOMAS J. MAYS, M.D.,

Professor of Diseases of the Chest in the Philadelphia Polyclinic, Visiting Physician to the Rush Hospital for Consumptives, etc.

WHATEVER its nature may be, it is quite certain that no other disease has elicited a greater number of conflicting opinions concerning its treatment than has croupous pneumonia. Forty years ago bleeding and blistering were regarded as its specifics; but these are now, and for the last twenty years have been, scarcely thought of in this connection. In the meantime hot poultices, aconite, veratrum viride, digitalis, quinine, etc., have taken their places; yet it is not too much to say that they have all led to disappointment and come to grief in the retort of clinical experience, and that finally the profession has gravitated to the conviction that the disease is self-limited in duration, and that hence all efforts to control its course are fruitless, if not actually harmful. To be thus compelled to stand before a disease and acknowledge one's helplessness and impotency is, to say the least, an unenviable position, but I must confess that until I became familiar with the value of local cold applications in this disease I was in hearty accord with this idea. Since then I may say that I am able to approach a case of pneumonia with a greater degree of assurance—not with the feeling, however, that we possess a specific, but with the confidence that here is an agent with which we are able to impress and circumvent the severity of the pneumonic process. I believe that cold properly applied will affect the death rate of pneumonia as profoundly as it has affected that of typhoid fever, and, although I do not expect a rapid introduction of this measure, on account of a deep-rooted prejudice which exists against the use of cold in almost all internal diseases, I trust that the evidence which is herewith submitted will serve to commend it to the serious attention of the profession. Under the titles, "Can Croupous Pneumonia be Abated?" and "Ice in the Treatment of Croupous Pneumonia," I contributed two papers to the *Medical News* of September 24, 1892, and January 21, 1893, respectively, in which are related three cases of pneumonia which were treated principally with applications of ice to the chest; and since the appearance of the first paper I instituted a collective investigation on a small scale by sending a number of circulars\* to various members of the profession, inviting a trial of the ice treatment.

The histories of the fifty cases which have been brought under my notice open many points of interest in the discussion of the influence of ice in the treatment of acute pneumonia, and as pertinent to this subject I will append the following comments:

**The Resolving Power of Ice on the Exudation.**—This is a marked feature in its therapeutic action and must be regarded as one of the strongest factors in its curative influence. This can at least be partly explained on the following basis: The most apparent lesion in croupous pneumonia is an enormous distension of the pulmonary capillaries, partial or complete stasis of the blood in these vessels, and exudation of the fluid constituents of the blood, and diapedesis of white and red blood cells into the alveoli of the lung. It is well known that cold has the power of contracting the blood vessels, and from this action one can understand why it should exert a beneficial action on pneumonia by giving tone to the capillaries, by restoring the normal blood flow and thus checking the leakage. But there is often reason for believing that it also dissolves the exudation in the pulmonary alveoli. For example, there may be a pneumonic area in which there is absence of respiratory murmur, the presence of a flat percussion note and bronchial breathing indicating beyond doubt that the process has passed beyond the stage of engorgement and into that in which the exudation has filled the alveoli, yet the application of ice will, in a remarkably short time, develop a new group of physical signs, such as crepitation, reappearance of the respiratory murmur, diminution of flatness, etc., indicating that a breakdown has occurred in the exudation. This has not only been observed by myself, but is dwelt on by Dr. Lees, who says: "In many cases I noticed a striking arrest in the development of the physical signs," and that the ice bag "distinctly tends to repress the inflammatory process in the lung."

**Influence on Symptoms.**—Not less decided is the influence of the ice on some of the most prominent symptoms of pneumonia. The pain, difficult respiration, cough and expectoration are remarkably relieved, and the temperature is frequently depressed two and three degrees in the course of half a day. The benefit which is exerted on these symptoms produces a very agreeable effect, and often makes the ice acceptable to those who at first protest against its use. This I have noticed in most of my cases, and it has also been witnessed by others, as will be seen in the histories of the cases which have been reported to me.

**Is the Ice Injurious?**—My own rather limited experience with the ice treatment does not show that it is accompanied or followed by any evil consequences, nor have any of those who reported cases to me observed any such results, although some of them kept the ice in position for two weeks. Dr. Lees says: "I have never seen any harm follow from the employment of the ice bag in pneumonia."

**Ages of Patients.**—It is important to note in this connection that the ages of the patients to whom the ice was applied varied from infancy to old age—the youngest being six months and a half old and the three oldest were sixty, sixty-five and seventy-four years respectively.

**The Results.**—It may be said, without claiming too much, that the results which have been obtained from the ice treatment of pneumonia are good. Out of the fifty cases which I collected but two were fatal, making a death rate of 4 per cent. In estimating this mortality rate it must be remembered that at least one of the cases that died was an exceedingly unpromising one, being a sufferer from chronic lead poisoning and also very intemperate; while the pneumonia which caused the death of the other one was in all probability an acute exacerbation of an old attack. In Dr. Lees' series of eighteen cases no deaths occurred, nor did any occur in the eleven cases reported by Dr. Jackson. Moreover, *The Lancet*\* refers to an article by Dr. Fleand, published in *Duodecim*, a Finnish medical journal (an original copy of which I am unable to procure), in which there is an account of 106 cases of pneumonia treated with ice applications by that gentleman, and, notwithstanding that among these there were ten cases of double pneumonia and that the epidemic of the disease was rather severe, he only had three deaths, or a death rate of 2.83 per cent. Adding these cases to those reported in my collection, there is a total of 156 cases of pneumonia treated with cold applications to the chest, with five deaths, or a death rate of 3.20 per cent. While the number of cases reported here is not very large, it is nevertheless evident that the results of the ice treatment are much superior to any other with which I am familiar. Thus, according to Osier, the mortality rate of 1,012 cases in the Montreal General Hospital was 20 per cent., while in the Charity Hospital at New Orleans it was 20.01 per cent. Of 1,000 cases of pneumonia treated in the Massachusetts General Hospital, from 1832 to 1889, there was a mortality of 25 per cent. In Dr. Hartshorne's valuable paper on pneumonia it is estimated that the death rate from this disease in the Pennsylvania Hospital during the years 1884, 1885 and 1886 was a little more than 31 per cent. In comparing the results of the ice treatment, so far as they go, with those which have been obtained from the treatment pursued in the above mentioned hospitals, I find that they are about eight times better under the former than under the latter method of treatment. It will be of great interest to see whether these satisfactory results can be maintained by future clinical investigation, and if this can be done even approximately it is needless to say that a pronounced advance in the therapeutics of acute pneumonia will have been made.—*The Lancet*.

#### MODERN EMPIRICISM AND "ORGANIC EXTRACTS," SO CALLED.

"TWENTY years since," remarks the venerable Benj. W. Richardson, "the medical profession was steering well and steadily toward great principles on the preventive as well as curative side of medicine. Then crept in the wild enthusiasm of bacteriological research, . . . restoring humoral pathology, ignoring nerve function, leading to Babel in its utter confusion of tongues, and separating for a time the modern art of cure from the accumulated treasures of knowledge, wisdom and light, for over two thousand years."

As a sequence also followed the present "boom" in empirical therapeutics, along with a measure of credulity the like of which has rarely been seen in the world's history. Nothing now, apparently, is too absurd for belief, and the whims, utterances, and roguery of charlatanism, promulgated and fostered to personal and mercenary ends, are accepted as scintillation of scientific research. Indeed, a hundred years hence, when the medical history of the nineteenth century comes to be written, it will demand the pen of a greater than Jonathan Swift to appropriately satirize the follies of the two final decades.

In the latter part of the seventeenth century medicaments derived from different organs of the animal economy obtained, but fell into desuetude before the rapid advances of chemistry and physiology. The tradition still remained, however, and three years since the medical world was electrified by the announcement of Brown-Séquard; and, while the evidence therefor appeared most convincing, subsequent subjection to careful control proved it was possessed of no better basis than coincidence, aided at times by the psychic phenomena that are comprehended in "faith cure," "suggestion," etc. Next Constantine Paul exhausted the theory by extending it to various organs of the body. In turn, copying, but giving no credit to M. Paul, an American physician promulgated the discovery of certain fluids, denominated by their author "Animal" and "Organic Extracts," all of which are likewise given various arbitrary titles ending in *ine*.

It is, however, announced, these extracts require from six to twelve months' maceration in their preparation, which certainly is an aspersion upon the intelligence of the scientific professions of medicine and pharmacy. Atop of this, the credulity of the twin professions is further appealed to in the theory that each organ selects and segregates from the blood its own peculiar pabulum, rejecting all else, and, consequently, any morbid process set up in such organ requires for its relief only the introduction into the circulation, by subcutaneous injection, of an extract derived from the prototype of such organ in some one of the lower animals.

It is not necessary to consider the absurdity of the claim that a prolonged period is required in order to extract the definite principles of an organ, especially when the fresh juice is admitted, even by the author of "Organic Extracts," to be totally inert; neither is it necessary to dwell upon the manifest anachronism embodied in this connection in the information that the investigation whereby such extracts were evolved and their merits discovered (and there are no less than six of these purported medicaments) have all been con-

ducted subsequently to thorough experimentation with the Brown-Séquard fluid, and are the sequels of many "instructive failures,"<sup>†</sup> further than to add it is manifest the amount of experimentation claimed, which at most cannot extend over a period of more than thirty months, does not tally therewith.

Nevertheless, on the strength of announcements that have received place in nearly, or quite, every medical periodical in North America, and, moreover, have been widely disseminated by the general and lay press, the idea has in many instances been accepted in good faith; and also a moderate craze been developed for "Organic Extracts," which a large number of the medical profession accept because of its scientific guise, without any knowledge of real composition or physiological effects, except as obtained through *ex parte* evidence furnished by advertising sheets and circulars.

Recently, a physician in Detroit, who was one of the earliest experimenters in a scientific way with the fluid of Brown-Séquard, and likewise with spermin or the so-called Charcot-Neuman crystals,† deemed the subject of "Organic Extracts" worthy of investigation, which investigation was conducted along with careful means of control.

For this purpose was selected "Cerebrine" and "Cerebrin," manufactured respectively by rival houses; and for purpose of control was employed a solution of borax in glycerin and water.

The result proved that all three fluids were equally valuable, or more properly equally inert, for any therapeutic purpose. Also that the claims set forth for "Cerebrine" and "Cerebrin" are entirely without foundation. In none of the experiments, and in no instance, in any one individual, in any series, even with the largest dose, was there any evidence of increase of pulse or temperature due to the medicament; neither was there manifested any "distension of the head; flushing of face; frontal, vertical, or occipital headache; exhilaration; unusual activity of mind; greater capability of effort; insomnia; increased excretion of urine; increased expulsive force of bladder and peristaltic action of intestines; relief of constipation; increase in power of vision, or improvement in appetite and digestion."

Again, the experimenter, in his own person, on different occasions, ingested doses of from five to two hundred and forty minims of "Cerebrine" and also "Cerebrin" with absolutely no effect; neither did the holding of such solution within the mouth for the period of half an hour produce any of the phenomena claimed. One half ounce ingested in the evening, just before retiring, in no way modified sleep.

Again, the circular wrapped around the containers of "Cerebrine" asserts the fluid to be "singularly efficacious" as a "resistant to the advances of old age; in nervous prostration and neurasthenia; hysteria; nervous dyspepsia; hypochondria, and mild forms of mental derangement; functional brain disturbance; temporary or long-continued brain exhaustion, resulting from intellectual or emotional strain; insomnia, resulting from over mental work—in such cases it should not be administered within four hours of bedtime."

It is somewhat remarkable, if "Organic Extracts" possess the power claimed, that their activity should be restricted to such a meager list of maladies. It is also a strange and suggestive coincidence, to say the least, that this enumeration particularly specifies only forms of diseases that are notably amenable to psychic phenomena—imagination, "faith cure," "Christian science" and "suggestion"—and likewise to spontaneous relief without medication.

The experiments of Dr. Stockwell, before noted, comprised three series of twelve men each, to an equal number of which was apportioned an equal quantity of "Cerebrine," "Cerebrin," and solution of borax. In the first series, the dose of each fluid was five minims, and the greatest increase of temperature did not exceed 0.05°. Neither did pulse, temperature, or respiration in any case show notable increase over the register taken prior to the injection, though carefully noted at intervals of one hour each, during thirteen hours. The averages throughout the day were as follows:

Experiment I.—For "Cerebrine": Respiration, 16.247; temperature, 98.55; pulse, 73.98. For "Cerebrin": Respiration, 17.412; temperature, 98.517; pulse, 73.979. For solution of borax: Respiration, 16.247; temperature, 98.552; pulse, 72.788.

Experiment II.—The doses were doubled, with the result of the following general averages for the day: "Cerebrine": Respiration, 17.249; temperature, 98.498; pulse, 73.17. "Cerebrin": Respiration, 16.666; temperature, 98.523; pulse, 73.288. Solution of borax: Respiration, 16.833; temperature, 98.499; pulse, 73.185.

Experiment III.—Doses increased to fifteen minims, resulting in the following averages for the day: "Cerebrine": Respiration, 15.249; temperature, 98.506; pulse, 73.921. "Cerebrin": Respiration, 17.758; temperature, 98.509; pulse, 69.939. Solution of borax: Respiration, 18.832; temperature, 98.507; pulse, 71.938.‡

In conclusion, it may be said that the charlatanistic agency of medicine during the present period has rendered it possible for so-called "Organic Extracts" to obtain wide, free advertising through the medium of the public press, both lay and medical, such as is rarely the good fortune of any article of commerce; that the status of medical education, unfortunately, is such that a large proportion of the physicians ignore entirely the relative relations of coincidence and fact, and of therapeutics to physiology and pathology. Further, the multitude of medicaments of the class above cited is such that they must, *per se*, obtain a short lease of life, hence, doubtless, the *raison d'être* of the statement that to secure perfect efficacy these extracts demand maceration of not less than six or eight months, and "preferably one year."

\* *Gaillard's Medical Journal*, April, 1893.

† See article on "Spermin" by Dr. Archie Stockwell, in *SCIENTIFIC AMERICAN SUPPLEMENT*, No. 730, October 19, 1890.

‡ See *New York Medical Journal*, January 28, 1893.

§ An examination into the claims of "Cardine," so called, was equally negative.

\* Similar circulars will be cheerfully sent by me to any one who may apply for them.

† *The Lancet*, November, 2, 1890.

\* August 10, 1892, p. 279.

† The suffix *ine* is properly used only to define doubly unsaturated hydrocarbons.

# THE VOLATILIZATION OF SILICA AND ZIRCONIA AND THE REDUCTION OF THESE SUBSTANCES BY CARBON.

By HENRI MOISSAN.

On submitting zirconia to the high temperature of the electric furnace, this oxide quickly enters into fusion. After the lapse of ten minutes, on operating with a current of 300 amperes and 70 volts, there appear very abundant white fumes. These fumes consist of the vapor of zirconia, which earth at this high temperature is in full ebullition. If the vapors are condensed upon a cold substance, we obtain a white powder, which is treated with very dilute hydrochloric acid to remove any lime present. After washing with boiling distilled water and desiccation there remains a white powder, which under the microscope appears as white rounded masses, without any transparent particles. This powder presents all the characters of zirconia. It scratches glass with ease, and its sp. gr. is 5.10.

After cooling, there remains in the crucible a mass of melted zirconia, with a crystalline fracture. Within the furnace, in the cooler parts, we sometimes find characteristic crystals of zirconia, of the form of transparent dendrites, of a vitreous luster, not attacked by sulphuric acid and capable of scratching glass.

This zirconia, when in fusion, is easily reduced by coke. If we place a quantity of zircon in a crucible of coke, we find below the residue of melted zirconia a metallic regulus of zirconium, containing neither carbon nor nitrogen, but containing variable quantities of zirconia.

On the contrary, on mixing zirconia with an excess of coke, we obtain a substance of a metallic appearance, not containing nitrogen, and which on analysis gave the following results:

	1	2	3
Carbon.....	4.22	4.60	5.10

When the zirconium carbide is richer in carbon, it is rapidly destroyed on exposure to the air.

This carbide may be refined so as to yield metallic zirconium by remelting in presence of an excess of liquid zirconia. Zirconium is a very hard body, which easily scratches glass and ruby. Its sp. gr. is 4.25. It therefore approximates very closely to that of Troost's zirconium (4.15).

**Silica.**—Fragments of rock crystal in a crucible of coke were exposed to the action of the electric arc produced by a current of 350 amperes and 70 volts. In a few moments the silica enters into fusion, and in seven or eight minutes ebullition sets in.

There then issues from the furnace, by the apertures which give passage to the electrodes, a smoke of a bluish color, lighter than that produced by zirconia. These vapors are given off plentifully as long as the experiment continues. They may be condensed by placing an inverted crystallizer at some distance from the apertures of the furnace. The interior of this crystallizer is rapidly coated with a slight layer of a scarcely transparent substance, of a slightly bluish white color. On taking up the contents of the crystallizer in water, and examining this residue under the microscope with a very low power, we see that it is chiefly formed of opalescent spheres, quickly soluble in hydrofluoric acid. These small spheres of silica visible to the naked eye are solid. They sometimes present at one point a hollow, which seems to indicate that the melted silica has contracted in volume in passing from the liquid to the solid state. Along with these spheres there are numerous particles of amorphous silica.

If we wish to collect a notable quantity of this product, it is better to use a furnace the cover of which has an aperture for the escape of the vapor of silica. A glass bell is placed over this aperture, and we may thus, in from ten to fifteen minutes, collect 30 grms. of a very light white powder, which is purified from lime by washing with dilute hydrochloric acid.

The form of the condensed silica depends of course on the more or less rapid refrigeration of the vapor. This process must not be too rapid if we wish to obtain numerous spherules of silica.

This silica is very soluble in hydrofluoric acid. It dissolves in the cold with a slight rustling noise. It is readily attacked by melting potassium hydrate and by alkaline carbonates. Its sp. gr. is 2.4, i. e., a little lower than that of rock crystal. The spherules scratch glass with ease.

On studying the deposit formed in glass globes in which the electric arc has been caused to play for lighting, we have found small globules of silica identical with those just described. The opalescence of glass globes in which the arc has been in action for some time is therefore due to the volatilization of silica. This silica is derived from the impurities of the electric carbons.

We will add that silica at this temperature is easily reduced by carbon, and yields a crystalline silicon carbide which we are further examining.—*Comptes Rendus*, cxvi., p. 1232; *Chem. News*.

## A STUDY OF LIGHT SOURCES BY PHOTOGRAPHY.

In a recent issue of *Nature*, reference was made to the photographic study of sources of light by means of a carefully graduated series of exposures, which was first applied with great success by M. Janssen to the investigation of the minute structure of the solar surface.

M. Crova has now applied a similar method to the study of the Carcel standard and the electric arc. A contrast between the various parts of the magnified photographic image of the Carcel flame does not appear until the exposure is reduced to the minimum necessary to secure an impression; and to bring out this contrast, the negative must be developed slowly and subsequently intensified. Four photographs thus obtained were exhibited at a recent meeting of the French Academy. The axis of the flame appears dark, and the zone of combustion exhibits two bright lines representing the external and internal surfaces of combustion of the hydrocarbons, with a dark line between them corresponding to the space where combustion is incomplete. Photographs of the flames of a candle, an amylacetate lamp, and a batswing gas jet were also exhibited, showing analogous phenomena. The same

method applied to the arc light yielded some very interesting results. As the time of exposure was reduced, the arc gradually vanished; the negative carbon was reduced to a very small surface, and the positive carbon exhibited a surface riddled with dark spots, and granulated like the surface of the sun in M. Janssen's photographs. These granulations could be seen in violent motion on the ground glass screen of a camera with the lens sufficiently stopped down. It follows that it is not admissible to screen off all but a very small portion of the luminous source, in order to reduce the amount of light in the same proportion as the area of luminous surface. With very small surface elements, both the amount of light and the temperature, and hence also the tint of the light, may be constantly changing.

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